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THE ANNALS  
AND  
MAGAZINE OF NATURAL HISTORY,  
INCLUDING  
ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND  
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY  
ALBERT C. L. G. GÜNTHER, M.A., M.D., Ph.D., F.R.S.,  
WILLIAM CARRUTHERS, Ph.D., F.R.S., F.L.S., F.G.S.,  
AND  
WILLIAM FRANCIS, F.L.S.

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VOL. IX.—EIGHTH SERIES.  
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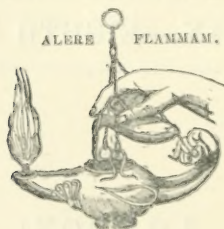
"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRÜCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . . The sylvan powers  
Obey our summons; from their deepest dells  
The Dryads come, and throw their garlands wild  
And odorous branches at our feet; the Nymphs  
That press with nimble step the mountain-thyme  
And purple heath-flower come not empty-handed,  
But scatter round ten thousand forms minute  
Of velvet moss or lichen, torn from rock  
Or rifted oak or cavern deep: the Naiads too  
Quit their loved native stream, from whose smooth face  
They crop the lily, and each sedge and rush  
That drinks the rippling tide: the frozen poles,  
Where peril waits the bold adventurer's tread,  
The burning sands of Borneo and Cayenne,  
All, all to us unlock their secret stores  
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

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# THE ANNALS

## AND

### MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

"..... per litora spargite museum,  
 Naiades, et circum vitreos consilite fontes:  
 Pollice virgineo teneros hic carpite flores:  
 Floribus et pictum, divæ, replete canistrum.  
 At vos, o Nymphæ Craterides, ite sub undas;  
 Ite, recurvato variata corallia trunco  
 Vellite muscosis e rupibus, et mihi conchas  
 Ferte, Deæ pelagi, et pingui conchylia succo."  
*N. Parthenii Giannettasi, Fel. 1.*

No. 49. JANUARY 1912.

#### I.—*New Genera and Species of Tabanidæ in the British Museum (Natural History).* By ERNEST E. AUSTEN.

(Published by permission of the Trustees of the British Museum.)

THE following paper contains descriptions of two new genera, thirteen new species, and one new variety. In addition, a very remarkable species is redescribed, and another species is renamed. The subjoined list may be useful as affording an indication of the habitats of the various species.

#### ETHIOPIAN REGION.

<i>Adersia</i> (gen. n.) <i>æstroïdes</i> , Karsch	Zanzibar; German East Africa.
(redescription).	
<i>Ægophagamyia</i> <i>pungens</i> , gen. et sp. n.	Zanzibar.
<i>Tabanus kingi</i> , Austen, var. <i>nigri-</i>	Abyssinia; East Africa Protec-
<i>feminibus</i> , var. n.	torate.
" <i>selousi</i> , sp. n.	Anglo-Egyptian Sudan (Bahr-el-
	Ghazal).
" <i>xanthomelas</i> , nom. nov. for	Gold Coast; Portuguese Congo;
<i>T. leucaspis</i> , v. d. Wulp	Congo Free State; Anglo-Egyptian
(nec Wied.).	Sudan (Mongalla Province);
	Uganda and Nyasaland Protec-
	torates.
" <i>producticornis</i> , sp. n.	Portuguese East Africa.
" <i>minuscularius</i> , sp. n.	" " "
<i>Ann. &amp; Mag. N. Hist.</i> Ser. 8. Vol. ix.	1

## MALAGASY REGION.

<i>Rhinomyza mordosa</i> , sp. n.	Madagascar.
<i>simplicicornis</i> , sp. n.	"
<i>Ægophagomyia remota</i> , sp. n.	Rodríguez I., Indian Ocean.
<i>terriceps</i> , sp. n.	Astove I., Indian Ocean.
<i>Bouvierella pulchella</i> , sp. n.	Madagascar.
<i>Chrysops aprugna</i> , sp. n.	"
<i>insulensis</i> , sp. n.	"
<i>lloydi</i> , sp. n.	"

## AUSTRALIAN REGION.

<i>Pangonia bancrofti</i> , sp. n.	South Queensland.
------------------------------------	-------------------

## PANGONIINÆ.

## Genus PANGONIA, Macq.

## Subgenus EREPHOPSIS, Rond.

*Pangonia bancrofti*, sp. n.

♀.—Length (10 specimens) 8·25 to 9·4 mm.; width of head 3·5 to 3·75 mm.; width of front at vertex 0·5 to 0·6 mm.; usual length of proboscis 2·6 to 3 mm.; length of wing 8·6 to 9·4 mm.

*Small, compactly built species, with short, rounded abdomen, and with proboscis depending vertically beneath the head.—Thorax slate-coloured\*, dorsum greyish pollinose, narrowly striped with grey, and ground-colour posteriorly (including scutellum) with a distinct metallic sheen (purplish blue, in centre sometimes with a greenish tinge); dorsum of abdomen (second to fifth segments inclusive) shining dark metallic blue, sometimes with a purplish tinge, especially at sides, and towards centre often with a greenish tinge, which may even almost entirely replace the blue, hind borders of first five segments metallic cinnamon-rufous or metallic cinnamon, often with a purplish tinge; wings faintly tinged with isabella colour, without spots or other markings; femora cinnamon-coloured.*

*Head: inner margins of eyes bordering front almost parallel, diverging but slightly below; face, jowls, and portion of front immediately above antennæ cinnamon-coloured, yellowish pollinose, occiput and upper two-thirds of front slate-grey, light grey pollinose; front, face, and upper portion of posterior orbits clothed with brownish or blackish hair, jowls and basioccipital region with bright ochraceous hair, eyes with raw-sienna-coloured hair, which*

\* For names and illustrations of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, & Company, 1886).



becomes brownish above; proximal joint of *pulpi* mummy-brown, yellowish pollinose, and clothed with brownish or yellowish hair, terminal joint ochraceous-buff or tawny-ochraceous, broad; first and second joints of *antennae* ochraceous-buff, clothed with black hair of moderate length, third joint ochraceous-rufous, brownish at tip. *Thorax*: dorsum clothed with black hairs, short for most part, but longer posteriorly and on scutellum, pleurae and pectus with longer ochraceous hair, mesopleurae mainly with blackish hair; grey pollinose stripes on dorsum three in number, extending from front to hind margin, median stripe extremely narrow, admedian stripes somewhat broader especially in front, transverse suture and sides of dorsum also grey pollinose. *Abdomen* very convex above, more or less rounded ovate in outline when viewed from the side, clothed above and below with short, appressed, bright ochraceous hair, which becomes longer and denser on the lateral margins and posterior angles of the dorsal scutes; dorsum of first segment, except hind border, slate-grey with a purplish tinge; dorsum of sixth and seventh segments grey, with dull cinnamon-coloured lateral margins and hind borders, grey area on sixth segment sometimes with a greenish or purplish metallic sheen; venter dark purple or purplish grey, except hind borders of segments, which are coloured as on dorsum. *Wings*: costa and fourth longitudinal vein dark brown, other veins raw-umber-coloured or mummy-brown, base of anterior branch of third longitudinal vein without an appendix; first posterior cell showing much individual variation as regards closure, often narrowly open, the degree of closure or opening frequently differing in the two wings of the same specimen; stigma raw-sienna-coloured (occasionally mummy-brown), elongate, and as a rule not very sharply defined, though distinct. *Squamae* isabella-coloured, fringed with ochraceous hair on outer side and on part of hind margin. *Halteres* light mummy-brown, stalks isabella-coloured. *Legs*: front coxae greyish cinnamon-coloured, middle and hind coxae drab-grey in front, isabella-coloured posteriorly; coxae and femora clothed with ochreous hair mixed with dark brown or black hair, the latter especially long and conspicuous on the under side of the middle femora; tibiae and tarsi raw-umber-coloured, tips of tarsal joints dark brown.

South Queensland, Australia: type and nine other specimens from the Upper Burnett District (*Dr. T. L. Bancroft*).

In shape and size this pretty little species, which the

author has much pleasure in naming in honour of its discoverer, somewhat resembles the West Australian *Pangonia gibbula*, Walk., from which, however, it is readily distinguishable owing to its proboscis being vertical instead of projecting downwards and forwards at an obtuse angle with the longitudinal axis of the body, and to the metallic appearance and peculiar coloration of the abdomen.

#### ADERSIA, gen. nov.

*Allied to the South American genus Scepsis, Walk.*—Female usually decidedly larger than ♂, often much larger, thorax bulkier and abdomen broader. *Posterior orbits broad in ♀ instead of non-existent, as in Scepsis ♀. Eyes bare, separate in both sexes, in ♀ relatively rather small; front narrow in ♂, broad in ♀ and protuberant when viewed in profile; ocelli present. Proboscis and palpi extremely short and small, former depending vertically beneath head, latter nearly horizontal; proximal joint of palpi (at least in typical species) not swollen, as in Scepsis; terminal joint of palpi more elongate and less swollen in ♂ than in ♀, cup-shaped in both sexes when viewed from outer side, having, at least in typical species, a pit-like depression at distal extremity; antennæ short, especially first and second joints; third joint lanceolate in profile, consisting of eight annuli; jaws narrow, not, as in Scepsis, descending a long way below lower margins of eyes. Inner margin of each eye in ♀ uniformly curved, not, as in the ♀ of Scepsis nivalis, Walk. (the type of the genus Scepsis, produced into an angle just above the fourth joint of the front. Wing with a distinct stigma, all posterior cells open; base of anterior branch of third longitudinal vein not (as in Scepsis) bent at a right angle, and not (as in Scepsis) emitting a backwardly directed appendix. Front claws long in both sexes; middle and hind claws longer and stouter in ♀ than in ♂.*

Typical species *Silvius astroïdes*, Karsch.

Although resembling *Scepsis* in general appearance and coloration, as also in the smallness of the proboscis, *Adersia* is sufficiently distinguished from its South American ally by the differences mentioned above, as well as by the remarkably broad front of the ♀, which is not narrowed by a constriction due to the inner margin of each eye being produced into an angle a little above the antennæ. From *Pronopes*, Lw., as represented by *Pronopes nigricans*, Lw., from Cape Colony,—the only species of the genus yet described and of which no specimens have so far reached

the British Museum (Natural History),—*Adersia* would appear to be distinguishable *inter alia* by the eyes being devoid of hair and the body comparatively bare, by the second abdominal segment not being abnormally large, and by the wings not being of relatively unusual length. The small, almost minute size of the proboscis will alone suffice to distinguish *Adersia* from any other genus of African Tabanidæ at present known.

The author has much pleasure in naming this new genus in honour of Dr. W. M. Aders, who, during his sojourn in Zanzibar, has paid special attention to its blood-sucking flies, and has materially increased our knowledge of the Dipterous fauna of the island.

*Adersia æstroïdes*, Karsch.

*Silvius æstroïdes*, Karsch, Berl. Ent. Z., Bd. xxxi. p. 371, Taf. iv. fig. 1 (1887).

[Since this species was originally described from an imperfect female, while both original description and figure leave much to be desired, no apology is needed for publishing the following redescription, which is based on both sexes, a number of specimens of each of which, in excellent condition, were fortunately obtained by Dr. Aders. The present writer desires to express his acknowledgments to Dr. K. Grünberg, of the Königlichcs Zoologisches Museum, Berlin, where the type of the species is preserved. With obliging courtesy Dr. Grünberg, at the request of the writer, carefully compared one of Dr. Aders's specimens with the type, and as a result formed the opinion that the two specimens are conspecific,—a conclusion with which the writer, after studying the notes kindly furnished to him by Dr. Grünberg, entirely concurs. It should be added that the type of the species, which is from the mainland (Usambara, German East Africa), is considerably larger than even the largest of the females obtained by Dr. Aders, which themselves exhibit considerable variations in size. According to Dr. Grünberg, the type measures 15·5 mm. in length, while, as will be seen below, the maximum length of the females from Zanzibar is 13·5 mm.]

♂ ♀.—Length, ♂ (6 specimens) 9·8 to 10 mm., ♀ (13 specimens) 10 to 13·5 mm.; width of head, ♂ 2·75 to 3·2 mm., ♀ 2·8 to 3·75 mm.; width of front of ♂ at vertex 0·75 mm., width of front of ♂ in centre 0·25 mm., width of front of ♀ 1·25 to 1·6 mm. at vertex, greater below; length of visible portion of proboscis in both sexes about 0·75 mm.; length of wing, ♂ 6·6 to 7·4 mm., ♀ 8·75 to 11 mm.

*Male dusky grey above (dorsum of thorax dark olive-grey, dorsum of abdomen slate-grey), ♀ lighter grey above (dorsum of thorax light olive-grey, with whitish-grey longitudinal stripes, dorsum of abdomen drab-grey or smoke-grey), extreme lateral margins of abdominal segments in both sexes cream-buff or pinkish buff. Head light yellowish grey in ♂, cream-coloured in ♀, upper portion of front in ♂ mouse-grey. Third joint of antennæ clove-brown or black, first and second joints paler (mouse-grey or isabella-coloured in ♂, buff in ♀). Wings milky; fork of third longitudinal vein, cross-veins at each end of discal cell, and sixth longitudinal vein before middle faintly suffused with drab,—these markings sometimes indistinct; stigma light mummy-brown, in ♂ often paler than in ♀. Legs cream-buff or cream-coloured, femora in ♂ more or less grey.*

*Head:* vertex and darker portion of front in ♂ clothed with pale yellowish hair, face and jowls in ♂ clothed with whitish hair; front in ♂ with a blackish, elongate spot in centre below ocellar tubercle, extending from eye to eye; in ♀ face, jowls, and upper three-fourths of front clothed with minute whitish hairs; *palpi* cream-buff, often more or less grey in ♂, clothed with whitish hair; *proboscis* ochraceous-buff, length of visible portion not exceeding 1 mm., usually only about 0.6 or 0.75 mm.; first and second joints of *antennæ* very short, clothed with short whitish hair, third joint ochraceous-buff at extreme base. *Thorax:* pleura and pectus grey in ♂; in ♀ pleura cream-coloured, disc of pectus light grey; in both sexes pleura and pectus clothed with whitish hair; dorsum clothed with minute, appressed, yellowish hairs; in ♀ these hairs are so small that, on a superficial inspection, the dorsum appears bare; whitish-grey longitudinal stripes on dorsum of ♀ fairly broad, consisting of a pair of admedian stripes which posteriorly are only narrowly separated or even apparently fuse together, and a more or less distinct stripe above base of each wing: in some specimens near front margin there is also an indication of a narrow median stripe; scutellum dark grey in ♂, in ♀ greyish buff or drab. *Abdomen* clothed in both sexes with short whitish hair, which is longer on sides, especially in ♂; dorsum with a dark, median, longitudinal stripe, more conspicuous in ♂, extending from second segment almost to distal extremity, more or less interrupted by hind margins of segments, and formed by minute black hairs among the whitish ones; whitish hair on dorsum of ♀ extremely small and closely appressed; in ♀ dorsal plate of last segment, either entirely



or for most part, and hind margins of some at least of preceding segments cream-buff; venter light grey or more or less cream-buff, without a dark longitudinal stripe. *Wings*: costa as far as stigma, auxiliary and first longitudinal vein to same point, third longitudinal vein between anterior transverse vein and fork, and portion of fifth longitudinal vein from base to fork buff, veins elsewhere for most part dark brown. *Squame* waxen white. *Halteres*: stalks cream-buff, knobs ivory-white. *Legs* clothed with whitish hair; under side of front femora shining, more or less dark brown in ♂, buff-yellow in ♀; claws black, buff or cream-buff at base.

Zanzibar and German East Africa (Usambara): type of ♂, type of redescription of ♀, and eight other specimens (4 ♂♂, 4 ♀♀), from Pigaduli, Zanzibar, 14. vi. 1911, "on sandy bank"; 3 ♀♀, same locality, 23. v. 1911, "on sandy bank"; 3 ♀♀, same locality, 10. xi. 1910, "numerous on sand"; 1 ♀, same locality, 12. xi. 1910; 1 ♂, 1 ♀, Bububu, 7. xii. 1910: all collected and presented by Dr. W. M. Aders.

Writing to the author on June 26, 1911, Dr. Aders remarked that the species described above had been "found almost exclusively in one place, generally on a hot, sandy bank where cattle are buried." Dr. Aders added that the cadavers of the cattle seemed to possess a great attraction for these flies. No information as to the blood-sucking powers of *Adersia oströides* has yet been received, although it may be mentioned for what the observation may be worth that natives in Zanzibar assert that the species bites\*. The peculiar coloration of the body and wings, which in the case of the body is most marked in the female sex, recalls that of other Diptera inhabiting sandy or desert regions, and is doubtless protective when the insects are resting on sand.

## Genus RHINOMYZA, Wied.

### *Rhinomyza mordosa*, sp. n.

♀.—Length (10 specimens) 7 to 8.6 mm.; width of head 2.2 to 2.6 mm.; width of front at vertex 0.25 mm.; length of proboscis 1.5 to 1.8 mm.; length of wing 7.25 to 8.25 mm.

*Small, narrow-bodied species, allied to Rh. maculata, Surcouf*

\* From information supplied to the writer in conversation, 12. vi. 1911, by Dr. A. Copland, who brought home a portion of the material collected by Dr. Aders.

(S.-E. Madagascar), but distinguished by presence of a well-marked, continuous, pale median stripe on dorsum of abdomen, as also by certain differences in wing-markings.—Dorsum of thorax russet-coloured; dorsum of abdomen, in fully coloured specimens, mummy-brown, with a pale (raw-sienna-coloured) median longitudinal stripe; antennæ raw-sienna-coloured, unicolorous, upper branch of third joint very short, merely a forwardly directed tooth; wings nearly hyaline, with, in distal half, two conspicuous sepia-coloured blotches resting on costal border.

*Head* buff or orange-buff pollinose (occiput smoke-grey), basioccipital region sparsely clothed with yellowish hair; front slightly broader below; ocellar spot greyish clove-brown; *frontal callus* tawny or tawny-ochraceous, narrow, only slightly expanded below, its upper extremity linear; *eyes* in specimens preserved in spirit dark bronze-green, without bands; *palpi* buff, proximal joint clothed with yellowish hairs, terminal joint clothed on outer side with minute black hairs; first and second joints of *antennæ* clothed above and on outer side with minute black hairs. *Thorax*: dorsum, including scutellum, clothed with minute, appressed, pale buff-yellow hairs, prealar callus on each side clothed with dark brown hairs; *pleuræ* and *pectus* cream-buff, covered with pearl-grey pollen, and sparsely clothed with whitish hair. *Abdomen*: median dorsal stripe varying in width in different specimens (sometimes very narrow on third and following segments), extending from base of abdomen to hind margin of sixth segment; imperfectly coloured specimens sometimes more or less pale (dull ochreous) on first two or three segments, on each side of median stripe; dorsum clothed for most part with minute, appressed, black hairs, but on median stripe and on lateral margins with similar pale yellow hairs, which also more or less predominate generally on fourth and fifth segments, besides clothing hind border of third segment; *venter* buff or ochraceous-buff, clothed with appressed yellowish hairs. *Wings*: the two main sepia-coloured blotches are situate as follows: firstly, a blotch includes the conspicuous, mummy-brown *stigma*, and then, narrowing considerably, either terminates on the third longitudinal vein (or in the first submarginal cell before reaching that vein), or extends across the wing to the bottom of the distal extremity of the discal cell, enclosing the posterior transverse vein, filling the extreme bases of the second and third posterior cells, and sometimes even extending into the angle in the upper margin of the fourth posterior cell; secondly, a blotch which occupies the distal

extremities of the marginal and submarginal cells, extends across the anterior branch of the third longitudinal vein into the upper part of the second submarginal cell, and has its proximal margin nearly straight and at right angles to the costa; the length of the space separating the stigmatic from the apical blotch, measured on the costa, varies in different individuals from about 1 mm. to about 1.4 mm.; the fork of the third longitudinal vein is suffused with sepia, and the small sepia-coloured spot so formed is sometimes connected either with the apical blotch, or, in the first posterior cell, with a forwardly directed prolongation from the stigmatic blotch, or with both; in addition to the foregoing the proximal half of the first basal cell is occupied by a faint, light sepia-coloured streak, sometimes indistinct; in specimens in which the stigmatic blotch does not extend beyond the third longitudinal vein, the veins at the distal extremity of the discal cell are still often suffused with sepia; veins mummy-brown, auxiliary vein paler, anterior transverse vein and extreme base of third longitudinal vein usually darker than remainder of veins. *Squammæ* sepia-coloured. *Halteres*: knobs seal-brown above, ochraceous-buff below; stalks buff, brownish at distal extremity. *Legs* buff or ochraceous-buff, distal extremities of both front femora and front tibiæ brown or brownish; front tarsi dark brown, proximal two-thirds of first joint paler, tips of middle and hind tarsi dark brown.

Madagascar: type and thirteen other specimens from Andranolava, Majunga Province, North-West Madagascar, 24. xi. 1907 (*J. J. Lloyd*); a fifteenth specimen, from same locality and collector, 8. xi. 1907.

With reference to this species the collector writes:—"A very active fly; bites like a mosquito. All the specimens sent were taken at dusk."

*Rhinomyza simplicicornis*, sp. n.

♀.—Length (8 specimens) 6.75 to 8.2 mm.; width of head 2.4 to 3 mm.; width of front at vertex 0.5 to just over 0.5 mm.; length of proboscis 1.2 to 1.25 mm.; length of wing 6.25 to 7.4 mm.

*Small, thick-set species, with third joint of antennæ totally devoid of an upper branch, and wings without coloured bands, spots, or blotches, though with very conspicuous dark brown stigma.*—Thorax greyish cream-buff, dorsum with three fairly broad, burnt-umber-coloured or dark brown, longitudinal stripes, converging posteriorly, and with a dark brown spot on

*scutellum*; *dorsum of abdomen* (in fully coloured specimens not altered by post-mortem changes) *transversely and consecutively banded with cream-colour, dark brown, light grey, and mummy-brown.*

*Head* cream-buff pollinose (occiput light grey), basi-occipital region clothed with yellowish-white hair; front much broader than in foregoing species, widening slightly below; ocellar spot greyish clove-brown; *frontal callus* cinnamon, cinnamon-rufous, or light mummy-brown, of normal shape, except that there is a pollinose indentation on each side, forming a constriction, just above lower extremity; *palpi* cream-buff, proximal joint clothed with pale yellowish hairs, terminal joint varying in width in different specimens but not particularly attenuated, clothed on outer side with minute black hairs; *antennæ* short, first and second joints clothed with minute black hairs, expanded portion of third joint ochraceous-buff, unusually broad from above downwards, with nothing in the shape of an upper branch, but with the upper margin rising in the centre into a prominent angle, four distal annuli clove-brown or black, unusually short, of uniform width, terminal annulus ending bluntly. *Thorax*: dark dorsal stripes commencing just behind level of humeral calli, median stripe usually reaching scutellum but paired stripes not extending beyond postalar calli; *dorsum* clothed with short, appressed, pale yellowish hair, and with blackish hair on dark brown scutellar spot, which occupies whole of upper surface of scutellum except margin; *pleuræ* and *pectus* clothed with yellowish-white hair; *mesopleuræ* dark brown below, *sternopleuræ* also largely dark brown on each side of middle line, but in both cases ground-colour partially concealed by the light grey pollen clothing *pleuræ*, *pectus*, and sides of *dorsum*. *Abdomen*: *dorsum* in fully coloured and unaltered specimens marked as follows,—first segment and anterior third or half of second cream-coloured; remainder of second segment and third segment entirely dark brown; fourth segment light grey, more or less dark brown, ochraceous-buff, or cinnamon on front border; remaining segments mummy-brown, hind margins of fifth and sixth segments greyish; the front margin of the dark brown band is often somewhat irregular, but in the middle line frequently sends out a triangular projection, which does not quite reach the posterior edge of the first segment; in imperfectly coloured specimens, or such as show post-mortem changes, the dark brown band is less sharply defined, and frequently exhibits irregular patches of paler (mummy-brown) colour near the front



margin of the third segment; dorsum clothed with minute, appressed hairs, pale yellowish or yellowish white on the fourth segment and on the cream-coloured band at the base, dark brown on the dark brown band, and lighter brown on fifth and following segments; venter in non-discoloured specimens cream-coloured at base, then mainly cream-buff, whitish cream-buff, or whitish, followed by ochraceous-buff at distal extremity, which is clothed with brownish hair, venter elsewhere clothed with minute, appressed, yellowish-white hair. *Wings* with a faint sepia-coloured tinge, which in certain specimens is somewhat more pronounced at extreme tip, next costa; veins for most part dark brown, those forming distal boundary of first and second basal cells darker than elsewhere, and more or less suffused with sepia; *stigma* sharply defined, varying in length in different specimens from 1.2 to 1.4 mm. *Squamæ* sepia-coloured, border dark brown. *Halteres*: knobs clove-brown, stalks cream-buff, dark brown at distal extremity. *Legs* cream-buff or buff, tips of front and hind femora and tibiæ dark brown, tips of middle femora and tibiæ brown, front tarsi clove-brown, middle and hind tarsi dark brown, proximal two-thirds of first joint of middle tarsi paler.

Madagascar: type and nine other specimens from Andranelava, Majunga Province, North-West Madagascar, October 15 to November, 1907 (*J. J. Lloyd*).

The collector's field-note runs:—"Seen from October 13 to November. Appears only in cool places, usually in evening. Bite very painful."

So far as the structure of the third joint of its antennæ is concerned, the species described above is an aberrant form, which agrees with *Rhinomyza edentula*, Wied., and *Rh. pusilla* (*Erodiorhynchus pusillus*), Schin.—the habitat of each of which is the Cape of Good Hope,—in the absence of an upper branch to the joint in question. As regards the remainder of its cephalic characters, except that the proboscis is somewhat shorter than usual, the new species is a true *Rhinomyza*, and to place it in this genus—the only existing one to which it could possibly be assigned—is preferable to founding a new genus for its reception. The comparative shortness of its proboscis prevents *Rh. simplicicornis* from being regarded as belonging to the same group as *Rh. edentula*, Wied., and *Rh. pusilla*, Schin., though it agrees with these species in its wings being devoid of coloured bands or blotches. In the large size and conspicuous appearance of the stigma, as well as in having its wings otherwise unmarked, *Rh. simplicicornis* agrees with *Rh. (Dichelacra)*

*longirostris*, Big., which is also found in Madagascar, but in which the third antennal joint is of the typical form.

*ÆGOPHAGAMYIA* \*, gen. nov.

*Resembling and allied to Silvius, Mg., but distinguished by the absence of a frontal callus in the ♀, by the proboscis being slender and elongate, and by the first and fourth posterior cells in the wing being closed before reaching the margin. Distinguished from Scione, Walk., by the eyes not being hairy nor the face conical. Distinguished from Bouvierella †, Surcouf, in which the first and fourth posterior cells in the wing are also closed, by the absence of a frontal callus in the ♀, by the proboscis being slender and elongate, and terminated by narrow, elongate labella (instead of being short and having large labella), by the smaller antennæ—especially the less elongate third joint, and by the first posterior cell in the wing being closed a relatively long way from instead of close to the hind margin, the stalk of the first posterior cell being two or three times as long as, instead of approximately equal in length to, only slightly longer or even shorter than that of the fourth posterior cell.—Body Tabanus-like in shape. Eyes meeting together above in ♂; front in ♀ of moderate breadth, its sides parallel; facets in front portion of eyes of ♂ not conspicuously larger than those behind; ocelli present. Proboscis and palpi slender, former elongate and prominent, projecting downwards and forwards, or (in ♂) sometimes horizontal, not thickened at base; labella long and narrow. Palpi small, in ♂ linear and horizontal or slightly curved upwards, terminal joint in ♀ elongate, somewhat swollen at base then bent downwards and acicular. Antennæ short, especially first and second joints, third joint lanceolate in profile, without any projection on its upper margin; terminal portion of third joint indistinctly annulate, composed of four annuli. Wings hyaline; first posterior cell with a long stalk, i. e. closed 0.6 to 0.75 mm. before reaching hind margin; fourth posterior cell closed either just before margin, or at any rate nearer to margin than point at which first posterior cell is closed; anterior intercalary vein, though sometimes complete, often terminating abruptly before reaching margin.*

\* αἰγοφάγος, goat-eating (in allusion to the fact that all the specimens of the typical species taken by Dr. Aders in Zanzibar were found on goats); μῦια, a fly.

† See below, p. 16. With the exception of *B. (Scione) alluaudi*, Giglio-Tos, the habitat of which is the Seychelles Is., the eight species of *Bouvierella* at present known are confined to Madagascar.

Typical species *Egophagamyia pungens*, sp. n. It is worthy of note that the three representatives of the genus *Egophagamyia* at present known, all of which are described below, are island forms, the typical species having been obtained in Zanzibar and the other two species in Rodriguez I. and Astove I. respectively.

*Egophagamyia pungens*, sp. n.

♂ ♀.—Length, ♂ (7 specimens) 10·2 to 11·75 mm., ♀ (4 specimens) 9·6 to 11·2 mm.; width of head, ♂ 3 to 3·75 mm., ♀ 2·8 to 3·5 mm.; width of front of ♀ at vertex 0·5 to 0·6 mm.; length of proboscis, ♂ 2 mm. (in normal position) to 3·5 mm. (protruded), ♀ 1·75 to 2·5 mm.; length of wing, ♂ 7·75 to 9 mm., ♀ 8 to 9·25 mm.

Frontal triangle in ♂, viewed from above, bright cream-coloured or glistening white, pollinose; front and face in ♀ dull greyish cream-coloured; first and second joints of antennæ in both sexes buff or ochraceous-buff, third joint clove-brown; dorsum of thorax dark olivaceous-grey in ♂, lighter grey in ♀, in both sexes with faint darker streaks but without distinct markings; abdomen in ♂ ochraceous or tawny-ochraceous, with on dorsum a very conspicuous, blackish slate-coloured, median longitudinal stripe; abdomen in ♀ slate-grey on dorsum, the sides of the first four and lateral margins of remaining segments dull ochraceous-buff.

Head: face and jowls in both sexes clothed with whitish hair, short on face, longer on jowls; upper three-fourths of front in ♀ clothed with minute whitish hairs, mingled towards vertex with some blackish hairs; occiput in both sexes smoke-grey; palpi buff; proboscis greyish clove-brown, labella clove-brown; third joint of antennæ buff at extreme base. Thorax: pleurae and pectus grey, lighter in ♀ than in ♂, clothed in both sexes with whitish hair; dorsum clothed with short, erect, yellowish hair in ♂, and with similar, whitish or yellowish-white hair in ♀. Abdomen: median stripe on dorsum of ♂ extending from base to distal extremity, narrower than elsewhere on third and fourth, or third, fourth, and fifth segments, dorsum of sixth segment in some ♂♂ for most part or entirely blackish slate-coloured; venter ochraceous in ♂, ochraceous-buff in ♀, without markings; abdomen clothed in ♂ with short, appressed, pale ochre-yellow hairs, in ♀ with similar pale yellowish hairs, on dorsum in both sexes mingled with black hairs towards distal extremity; ochraceous-buff area on dorsal side of first four segments in ♀ varying in width,

sometimes so broad as to reduce slate-grey area on these segments to a median stripe, in other specimens very narrow and confined to lateral margins. *Wings*: veins for most part brown, auxiliary vein buff, base of first longitudinal vein ochraceous-buff; stigma wanting. *Squamae* cream-coloured, small. *Halteres*: stalks light isabella-coloured, knobs cream-buff. *Legs*: femora and tibiae ochraceous, femora more or less streaked with dark grey, hind tibiae brownish on upper side, sometimes entirely dark brown except at extreme base, tips of front and middle tibiae sometimes brown or brownish; tarsi dark brown, first joint of front and middle pairs often paler (ochraceous or ochraceous-rufous) at base.

Zanzibar: type of ♂, two other ♂♂, and two ♀♀ from Bububu, 7. xii. 1910; type of ♀, four ♂♂, and one other ♀ from Pigaduli, 14. vi. 1911, "on goats": all collected and presented by Dr. W. M. Aders.

The collector's field-note is as follows:—"Very restricted in its occurrence: all the specimens of this species were caught within a radius of two miles, and always on goats."

*Ægophagamyia remota*, sp. n.

♂.—Length (1 specimen) 10.8 mm.; width of head 3.6 mm.; length of proboscis 2 mm.; length of wing 9.6 mm.

*Agreeing with foregoing species in coloration and markings, except that the dark median stripe on dorsum of abdomen is broken up into spots; frontal triangle more prominent, and face (viewed in profile) inclined more obliquely backwards than in preceding species; terminal joint of palpi 0.8 mm. in length, longer than in foregoing species; front and middle femora, except at extreme tips, entirely greyish clove-brown.*

*Head*: face and jowls clothed with whitish hair; *palpi* ochraceous, terminal joint dark brown at tip; *proboscis* dark brown; first and second joints of *antennae* tawny-ochraceous, clothed above and on outer side with short black hairs, first joint more bulky and with a more prominent upper angle than in foregoing species (third joint wanting in type). *Thorax* and *abdomen* clothed with yellowish hair: median dorsal stripe on abdomen (at least in case of type) much narrower on second segment than in *Ægophagamyia pungens*; commencing at base of first segment, on which it occupies a median area equal to half the width of the segment, the stripe abruptly narrows on the second segment to about half its previous width and terminates suddenly at one-third of



the length of the segment from the hind margin ; on the third segment the stripe is represented by a scutiform median spot, extending from the base to a little beyond the middle ; on the fourth segment there is a smaller though rather wider median spot, somewhat triangular in outline, resting on the base of the segment and with its apex extending to a little beyond the middle ; the fifth and sixth segments each bear a broad transverse blotch, resting on the base of the segment, but not extending to either the lateral or posterior margins. *Wings* : first posterior cell closed 0.6 mm. from margin ; anterior intercalary vein (in typical specimen) terminating abruptly just beyond halfway between end of discal cell and hind margin of wing ; stigma exceedingly faint, not noticeable. *Squamae* cream-buff. *Halteres* as in foregoing species. *Legs* : hind femora ochraceous, distal extremity dark brown, under side greyish dark brown ; tibiae and tarsi as in foregoing species.

Rodriguez I., Indian Ocean : presented by the Royal Society.

*Ægophagamyia terticeps*, sp. n.

♀.—Length (2 specimens) 10.6 to 11 mm. ; width of head 3.5 to 3.75 mm. ; width of front at vertex 0.75 mm. ; length of proboscis 2.25 to 2.6 mm. ; length of wing 8.75 to 9 mm.

*Resembling* *Ægophagamyia pungens* ♀, *but distinguished by face being more protuberant, by ochraceous-buff area on dorsum of abdomen being confined to posterior angles of second and third and extreme lateral margins of following segments, and by the femora, except extreme base and tips, being entirely dark (greyish clove-brown).*

*Head* : face and lower third of front isabella-coloured, occiput and upper two-thirds of front dark grey ; median portion of face conspicuously protuberant, when head is viewed in profile ; face, jowls, and basioccipital region clothed with whitish hair, upper part of front clothed with dark brown hair ; *palpi* buff, terminal joint greyish on outer side ; *proboscis* greyish clove-brown, *labella* clove-brown ; first and second joints of *antennæ* ochraceous-buff, clothed for most part with short black hairs, third joint clove-brown, ochraceous-buff at extreme base. *Thorax and abdomen* : general coloration and hairy covering of thorax and of dark portion of dorsum of abdomen as in *Ægophagamyia pungens* ♀ ; ochraceous-buff areas on dorsal surface of second and third abdominal segments varying in size, sometimes much reduced, especially on third segment ; ventral surface of

fifth (or fourth) and following segments (at least in type and para-type) with a dark transverse band, occupying anterior two-thirds of each segment. *Wings*: first posterior cell, in type and para-type, closed 0.75 mm. from margin; anterior intercalary vein varying in length, terminating abruptly before reaching margin; veins mainly mummy-brown or dark brown, auxiliary vein, base of first longitudinal, and main portion of fifth longitudinal vein paler (cinnamon); stigma transparent, not noticeable. *Squamæ* cream-buff. *Halteres* as in *Egophagamyia pungens*. *Legs*: tibiæ and tarsi clove-brown, middle tibiæ, except distal extremity, sometimes paler (cinnamon), proximal portion of front tibiæ also cinnamon-coloured in case of type.

Astove I., Indian Ocean (north of Madagascar); type and one other specimen (*P. R. Dupont*).

### Genus BOUVIERELLA, Surcouf.

(Bulletin de Muséum National d'Histoire Naturelle, Année 1909, p. 176 (Paris, 1909).)

#### *Bouvierella pulchella*, sp. n.

♀.—Length (1 specimen) 12.6 mm.; width of head 4 mm.; width of front at vertex 0.6 mm.; length of proboscis 1.75 mm.; length of wing 10.4 mm.

*Head, pleuræ, and pectus grey, dorsum of thorax slate-coloured, with a pair of faint, grey, admedian, longitudinal stripes; first two abdominal segments cream-buff, each marked on dorsum with a black blotch, that on second segment median, elongate-rectangular, that on first segment occupying greater part of dorsum except posterior angles, and tapering to hind margin; remaining abdominal segments black, hind margins of third to fifth segments inclusive pearl-grey, clothed with silvery-white hair; wings light isabella-coloured; legs, except coxæ, entirely black.*

*Head*: subcallus, face, jowls, and basioccipital region pearl-grey, clothed with white hair, upper part of front blackish slate-coloured and clothed with blackish hair; *frontal callus* clove-brown, cuneate, with the upwardly directed apex prolonged into a narrow raised line; front narrowing slightly below; *palpi* slender, slate-grey on outer side; *proboscis* clove-brown; *antennæ* entirely clove-brown or black, except articular surface of third joint on outer side, which is narrowly cinnamon, first and second joints clothed with short black hair, expanded portion of third joint without an angular prominence on upper margin. *Thorax*: humeral

calli and lateral borders of dorsum grey, median stripes on dorsum commencing on front margin but becoming indistinct beyond transverse suture; *scutellum* slate-black, darker than remainder of dorsum; pleura and pectus clothed with white hair, dorsum somewhat sparsely clothed with minute, appressed, yellowish-white hairs, mixed with longer and more erect black hairs; a patch of longer silvery-white hair above base of wing on each side, and a smaller patch of similar hair on anterior extremity of each postalar callus; *scutellum*, portion of dorsum immediately in front of præscutellar groove, and remainder of postalar calli clothed entirely with black hair; prealar calli clothed with black mixed with silvery-white hair. *Abdomen*: median black blotch on dorsum of second segment extending from base almost to hind margin; ventral surface of third and following segments agreeing with dorsum in coloration and banding; black portion of abdomen clothed with black hair, which on dorsum of second segment also extends a little way outwards from sides of median blotch; cream-buff area clothed with yellowish-white hair, hind border of dorsum of second segment with whitish hair, which also extends on to the hinder portion of the median black blotch; posterior angles of dorsal scutes of third to fifth segments inclusive cream-buff, clothed with silvery-white or yellowish-white hairs, which more or less fringe the lateral margins of these scutes; posterior portion of dorsum of sixth segment somewhat greyish, with a few yellowish hairs on hind margin in middle line. *Wings*: extreme base and costal cells ochre-yellow; stigma orange-ochraceous, narrow; costa dark brown, auxiliary vein and main portion of fifth longitudinal vein orange-ochraceous, remaining veins mummy-brown. *Squæmæ* light sepia-coloured, border mummy-brown. *Halteres* dark sepia-coloured, stalks buff at base. *Legs*: coxæ grey, clothed, like proximal half of under side of hind femora, with white hair; legs elsewhere clothed with black hair.

Madagascar: type from Andranolava, Majunga Province, North-West Madagascar, 25. x. 1907 (*J. J. Lloyd*).

The collector's field-note on this species is as follows:—"Observed first on Oct. 25th, 1907; taken at midday in vicinity of office. Another specimen was seen on the following day, but not captured; these were the only two individuals observed up to Oct. 30th, 1907. The natives know this fly and state that it oviposits in loose earth; its bite is said to be very painful; these flies are reported to become more plentiful later in the season."

Owing to its striking markings, this handsome species

cannot be confused with any other of its congeners at present known.

Genus *CHRYSOPS*, Meigen.

*Chrysops aprugna*, sp. n.

♀.—Length (4 specimens) 7·25 to 8·75 mm.; width of head 2·4 to 2·8 mm.; width of front at vertex 0·75 to 0·8 mm.; length of antennæ 2·2 to 2·4 mm.; length of wing 7 to 7·6 mm.

*Upper surface of thorax and abdomen blackish slate-coloured. —Antennæ entirely black, rather short, first joint somewhat swollen at base; frontal callus shining black; dorsum of thorax with a pair of narrow, light grey, longitudinal stripes; dorsum of abdomen on each side of first and second segments with a dull greyish cinnamon-coloured patch, more or less indistinct; hind borders of second and following abdominal segments on dorsal side yellowish-grey pollinose, in each case expanded in middle line into a more or less distinct triangle, seventh segment wholly grey pollinose; wings hyaline, first and second costal cells raw-sienna-coloured, extreme base, a conspicuous transverse band across middle (sharply defined except at posterior extremity), and a narrow border next costa at distal extremity of wing dark brown; middle and hind tibiae, and first joint of middle and hind tarsi except extreme tips tawny.*

*Head ochre-yellow pollinose (in rubbed specimens front and upper portion of posterior orbits yellowish-grey pollinose), frontal callus, quadrate facial tubercles (connected below by a median prolongation extending to margin of buccal cavity), and a spot below each eye shining black; ocellar spot greyish clove-brown; occiput slate-grey, except posterior orbits and a downward offshoot from latter on each side of occipital triangular extension of ocellar spot; frontal callus narrowly separated from eye on each side, its lower margin curved, its upper margin produced in middle line into an angle, which nearly reaches ocellar spot; face, jowls, and basioccipital region, except on shining black calli and spots, clothed with pale yellow or yellowish hair; pollinose portions of front clothed with similarly coloured hair (in some specimens between frontal callus and ocellar spot with dark brown or blackish hair); palpi greyish clove-brown, clothed on outer side and below with yellowish, pale yellow, or whitish hairs, terminal joint bluntly lanceolate in outline when head is viewed in profile; first and second joints of antennæ somewhat greyish pollinose, clothed with short, black hair. Eye-markings (as seen in six ♀ specimens preserved in spirit):*



occipital border\* broad, in contact with upper and lower as well as with posterior margin of eye, deeply notched and in some specimens actually divided into two parts; frontal spots large, and all three usually in contact with margin of eye; shaft attached to arrow-head, and, though sometimes not extending so far, usually reaching upper margin of eye and there forming a connection between upper extremity of occipital border and upper frontal spot; point of arrow-head not reaching lower extremity of occipital border, but shoulders of arrow-head sometimes in contact both with lower end of upper half of latter and with middle frontal spot. *Thorax* clothed with whitish hair, shorter on dorsum than on pleurae and pectus; paired light grey longitudinal stripes on dorsum commencing on front margin, and, when viewed from above, disappearing after extending over about anterior three-fourths of main portion of dorsum, when, however, the thorax is viewed obliquely from behind the posterior extremities of the stripes are seen to curve round on to the postalar calli; lateral borders of dorsum light grey; pleurae and pectus slate-grey, former marked with an undulating stripe of pale yellowish or ochreous pollen, which, commencing on each side above hind coxa, runs forwards along upper border of sternopleura as far as prothorax, and is connected with its fellow of the opposite side by a transverse band in front of the anterior coxae; there is also a patch of similarly coloured pollen on upper portion of each mesopleura. *Abdomen*: dorsum clothed for most part with minute, appressed, ochreous hairs (on basal angle sometimes with whitish hairs), which become longer towards distal extremity; venter slate-grey, clothed with minute, appressed, ochreous or pale yellowish hairs, more or less yellowish-grey pollinose, especially towards distal extremity and on sides of preceding segments. *Wings*: proximal and distal edges of transverse band both somewhat irregular, proximal edge commencing on auxiliary vein a little beyond level of proximal end of stigma, thence running obliquely to second longitudinal vein at origin of third longitudinal, from this point passing straight across distal extremity of first basal cell to angle at proximal end of discal cell, and thence to the posterior of the two angles at distal extremity of second basal cell; from this point the proximal edge of the band follows the veins forming the base and proximal boundary of the fifth posterior cell, passing over into the anal cell in the narrow, distal

\* For explanation and illustrations of terms, see E. Daecke, "On the Eye-Coloration of the Genus *Chrysops*" ('Entomological News,' vol. xvii. 1903, pp. 39-42, pl. i.).

portion of the latter, in which it becomes very faint, and so reaching the posterior margin of the wing: the distal edge of the transverse band commences on the costa, usually a little way beyond the end of the first longitudinal vein, forms a conspicuous projecting angle in the first submarginal cell, below which angle it is noticeably emarginate, and from the fourth longitudinal vein follows a somewhat irregular or slightly sinuous course to the vein forming the proximal boundary of the third posterior cell, after which it becomes obliterated; with the exception of its proximal margin, therefore, the transverse band does not reach the posterior margin of the wing, but becomes obliterated in the fourth and fifth posterior cells; dark brown border next costa at tip of wing commencing a short distance beyond transverse band (sometimes narrowly connected with distal margin of latter), and terminating just below distal extremity of anterior branch of third longitudinal vein; first basal cell with an ill-defined brownish longitudinal streak at its proximal extremity, second basal cell also slightly infuscated at extreme base. *Squamæ* light sepia-coloured, border darker. *Halteres* clove-brown. *Legs*: coxæ grey, clothed with whitish hair, front pair yellowish pollinose at base in front and sometimes with an ochraceous ground-colour; femora clothed with whitish hair, front pair clove-brown, more or less tawny at base, middle and hind femora greyish clove-brown, more or less tawny above, sometimes wholly tawny except extreme tips; front tibiae not incrassate, clove-brown, more or less raw-umber-coloured at base; front tarsi clove-brown, tips of middle and hind tarsi dark brown.

Madagascar: type and nine other specimens from Tsaramana, North-Central Madagascar, 19-28. iii. 1907 (*H. C. Holden*).

With reference to this species the collector writes as follows:—"Native name '*fihidambo*,' or wild boar fly. Numerous only in certain localities, which are wooded, well watered, and generally the haunts of wild boars, but not necessarily of cattle. Prefers the shade, and is more numerous in the forest and in the evening. Bite very sharp."

From *Chrysops madagascarensis*, Ricardo,—the only species of the present genus from Madagascar hitherto described,—*C. aprugua* is distinguishable *inter alia* by the wing-markings and coloration of the tibiae. In *C. madagascarensis* the wing-markings resemble those of the species described below as *C. Lloydii*, being blackish clove-brown in colour, and the transverse band being much broader than

in *C. aprugna*, and its distal margin convex towards the tip of the wing, instead of irregular and emarginate below an angular projection in the first submarginal cell; the tibiæ, too, in *C. madagascarensis* are entirely black. Apart from other characters, *C. aprugna* is distinguishable from *C. Lloydi* by the antennæ being entirely black, instead of having the first joint ochraceous, as also by the coloration of the wing-markings and shape of the transverse band. The distinctive characters of *C. aprugna* as regards the following species are pointed out at the end of the description of the latter.

*Chrysops insulensis*, sp. n.

♀.—Length (1 specimen) 6·5 mm.; width of head 2 mm.; width of front at vertex just under 1 mm.; length of wing 7 mm.

*Antennæ, body, and legs entirely black; wings nearly hyaline, base, costal border, both basal cells except an area just before their distal extremities (much larger in second than in first basal cell), and a very conspicuous transverse band across middle (sharply defined except at posterior extremity) blackish clove-brown; legs slender.*

*Head black; frontal callus, a large, cordate, facial tubercle occupying practically whole of face, and an inconspicuous spot below each eye shining black; ocellar spot shining black (in denuded specimen), broadly connected with frontal callus by a clove-brown area, which encircles frontal callus and extends a little way below it, connecting bases of antennæ; frontal callus roughly elliptical oval in outline, almost reaching eye on each side, its transverse diameter the longer; sides of front and of face narrowly brownish rawsienna-coloured pollinose, jowls (except shining spot below each eye), a small spot on each side of vertex next upper angle of each eye, and a narrow transverse band immediately below antennæ clothed with similarly coloured pollen; basioccipital region brownish pollinose; palpi black, terminal joint lanceolate in outline when head is viewed in profile, clothed on outer side with brownish pollen and short, blackish hair; antennæ of moderate length, first joint swollen, first and second joints clothed with blackish hair. Thorax: pleuræ and sides of dorsum brownish pollinose. Wings: blackish clove-brown costal border including costal cells and extending from base to just beyond distal extremity of anterior branch of third longitudinal vein, emarginate (and therefore narrower than elsewhere) in marginal cell, next distal edge of transverse band; in addition to costal*

border, blackish clove-brown area at base of wing includes extreme base, proximal three-fourths of first basal cell, proximal three-fifths of second basal (distal border of proximal dark area in basal cells thus runs obliquely forwards), and base of marginal cell; basal dark area joins proximal edge of transverse band in marginal cell, above point of origin of third longitudinal vein, whence proximal edge of band passes straight across tips of both basal cells, just touching proximal angle of discal cell, and so filling extreme distal extremities of basal cells with dark colour; proximal edge of transverse band touches proximal basal angle of fifth posterior cell, and dies away in narrow, distal extremity of anal cell; starting from costal border not quite midway between distal extremity of stigma and tip of second longitudinal vein, distal edge of transverse band forms a *conspicuous angle (apex of which rests on base of anterior branch of third longitudinal vein)*, then runs backwards towards base of wing and crosses main stem of third longitudinal vein about 0.5 mm. before its bifurcation; from this point distal edge of band passes somewhat obliquely across wing to proximal boundary of third posterior cell, after which it becomes indistinct; the band fills proximal two-thirds of fourth and fifth posterior cells, and then dies away towards hind margin of wing; portion of fifth longitudinal vein forming part of boundary of second basal cell bordered anteriorly with blackish clove-brown. *Squamæ* sepia-coloured, border darker. *Halteres* clove-brown. *Legs* clothed with blackish hair, none of the tibiae incrassate.

Madagascar: Ambohimombo Forest (*Dr. C. I. Forsyth Major*).

In *Chrysops insulensis* the shape of the transverse band on the wing resembles that seen in *C. aprugna*; apart from all other characters, however, the present species may be distinguished from the foregoing by the fact that the apex of the angle on the distal margin of the band rests on the base of the anterior branch of the third longitudinal vein, instead of being separated from it by a considerable interval. Other distinctive characters of *C. insulensis* as compared with *C. aprugna* are afforded by the much darker coloration of the wing-markings, by the much greater extent of the dark area at the proximal end of the basal cells, and by the legs being entirely black. From *C. madagascarensis*, Ricardo, as well as from the new species described below, *C. insulensis* is distinguishable at once by the distal margin of the transverse band being conspicuously angulate instead of nearly uniformly curved. When compared with the following



species, a further means of distinction is furnished by the wholly black antennæ.

Although the type of the present species is denuded, the characteristic wing-markings are quite distinctive as regards the other species of *Chrysops* at present known from Madagascar, and the description printed above is therefore sufficient for practical purposes. The details of the body-markings, if any, cannot be determined until further specimens are obtained. It may be noted that the type of *C. insulensis* was erroneously assigned by Miss Ricardo (Ann. & Mag. Nat. Hist. ser. 7, vol. ix., May 1902, pp. 369, 370) to *C. madagascarensis*; it is the second specimen mentioned by the authoress, whose description of the "shading" at the base of the wing is in reality taken from the type of the present species and not from that of *C. madagascarensis*, in the wing of which the basal cells, with the exception of their distal extremities, are entirely clear.

*Chrysops lloydi*, sp. n.

♀.—Length (4 specimens) 6·4 to 8 mm.; width of head 2·2 to 2·4 mm.; width of front at vertex 0·6 mm.; length of antennæ 2·6 mm.; length of wing 6·6 to 7 mm.

*First joint of antennæ ochraceous; body black, moderately shining, dorsum of thorax with two conspicuous yellowish-grey, pollinose, longitudinal stripes; wings hyaline, a narrow costal border clove-brown or black, and a broad and sharply defined transverse band across middle purplish clove-brown or purplish black, the purple tinge very noticeable when wings are viewed at a certain angle; distal margin of transverse band not angulate, but convex towards tip of wing; legs slender.*

*Head black; front, except frontal callus, clove-brown ocellar spot and hind border of vertex, two small dark brown spots connecting frontal callus with base of each antenna, and a median saffron-yellow pollinose area below frontal callus and between bases of antennæ, ochre-yellow pollinose; face, except shining black facial tubercles, and basioccipital region bright saffron-yellow pollinose; greater part of each jowl occupied by a large, shining black area, extending inwards from lower margin of eye; basioccipital region and front behind frontal callus clothed with pale yellow hair; upper part of o. ciput with an ochre-yellow pollinose, elongate fleck on each side of median downward extension of ocellar spot; frontal callus shining black, prominent, roughly oval in outline, narrowly separated from eye on each side, its transverse diameter the longer; facial tubercles roughly*

quadrate in outline, separated above by a narrow median interspace of saffron-yellow pollen, but connected below by a shining black (sometimes partly shining mummy-brown) median prolongation, which reaches anterior margin of buccal cavity; *palpi* black, inner surface of terminal joint paler, outer surface of terminal joint clothed with blackish hair; first and second joints of *antennæ* clothed with short black hairs, first joint slightly swollen, second joint dark brown above and on outer side, more or less ochraceous on lower part of inner surface and below, third joint clove-brown. *Thorax*: dorsum (including upper surface of scutellum) covered with short, erect, whitish hair, pleuræ and pectus clothed with longer brown or pale yellowish hair; admedian, yellowish-grey, pollinose stripes on dorsum narrow and sharply defined, commencing on front margin and extending over anterior two-thirds or three-fourths. *Abdomen* unicolorous, entirely without markings, clothed above and below with short, appressed, whitish hair. *Wings*: extreme base clove-brown; first and second basal cells entirely hyaline except at extreme tips; clove-brown costal border including costal cells and a narrow edging to costa, extending from distal margin of transverse band to just beyond tip of anterior branch of third longitudinal vein; proximal extremity of marginal cell infuscated; proximal margin of transverse band commencing on second longitudinal vein just before origin of third longitudinal, crossing distal extremity of first basal cell, just touching proximal angle of discal cell, and thence passing somewhat obliquely across anterior portion of distal extremity of second basal cell to meet basal boundary of fifth posterior cell at about its centre; from this point proximal margin of transverse band follows basal and proximal boundaries of fifth posterior cell, passing over into narrow, distal extremity of anal cell, and reaching hind margin of wing at tip of latter; distal margin of transverse band commencing on costal border a little way beyond distal extremity of stigma, and curving round to meet hind margin of wing at tip of fourth posterior cell; anal cell usually closed just before reaching wing-margin. *Squammæ* light sepia, borders dark sepia. *Halteres* clove-brown. *Legs* clove-brown or dark brown, clothed for most part with similarly coloured hair; first joint of front tarsi, except tip, burnt-umber-coloured; first joint of middle and first and second joints of hind tarsi, except tips, and third joint of hind and second and third joints of middle tarsi at base buff-yellow; middle tibiæ sometimes raw-umber-coloured, distinctly paler than femora; none of the tibiæ in the slightest degree incrassate.

Madagascar : type and three other specimens from Andranolava, Majunga Province, 20-29. xi. 1907 (*J. J. Lloyd*).

In a note attached to the type the collector wrote :—  
“The first specimen of this species that I have ever seen ; taken while biting me on the hand ; bite not very severe.”

Although agreeing with *Chrysops madagascarensis*, Ricardo, in the shape of the transverse band on the wing, *C. lloydi* may at once be distinguished from the species in question, as well as from its two new congeners described above, by the ochraceous coloration of the first antennal joint.

Table for the Determination of the Species of *Chrysops*  
at present known to occur in Madagascar.

- |  |                                   |
|--|-----------------------------------|
| 1. Antennæ entirely black . . . . .  | 2.                                |
| Antennæ not entirely black ; first joint<br>ochraceous . . . . .   | <i>lloydi</i> , Austen.           |
| 2. Distal margin of dark transverse band<br>on wing angulate or irregular . . . . .  | 3.                                |
| Distal margin of dark transverse band<br>on wing not angulate nor irregular, but<br>curved . . . . .   | <i>madagascarensis</i> , Ricardo. |
| 3. Basal cells in wing, with exception of<br>a small area near distal extremity<br>(larger in second than in first basal<br>cell), entirely filled with dark colour ;<br>projecting angle on distal margin of<br>dark transverse band on wing reach-<br>ing fork of third longitudinal vein ;<br>legs entirely black . . . . . | <i>insulensis</i> , Austen.       |
| Basal cells in wing almost entirely<br>hyaline ; projecting angle on distal<br>margin of dark transverse band on<br>wing not reaching fork of third longi-<br>tudinal vein ; legs not entirely black,<br>largely tawny . . . . .   | <i>aprugna</i> , Austen.          |

TABANINÆ.

Genus TABANUS, Linn.

*Tabanus kingi*, Austen, var. *nigrifeminibus*, var. n.

♀.—Length (5 specimens) 14 to 16·5 mm. ; wing-expanse of largest specimen 29·4 mm.

*Differing from the typical form of the species chiefly in the coloration of the frontal callus and of the middle and posterior femora.*

Agreeing with typical form of *Tabanus kingi*, Austen, as described and figured (‘Bulletin of Entomological Research,’ vol. i. pt. 4, pp. 291-293, figs. 1 & 2 a, January 1911), except that:—frontal callus is mummy-brown or dark mummy-

brown instead of black or clove-brown; upper distal angle of first joint of antennæ is conspicuously tipped with black, being covered with minute black hairs, and expanded portion of third joint is sometimes dark brown or brownish, except perhaps at base: on dorsum of thorax, especially on scutellum, the black hair is often more in evidence, giving a darker effect and rendering the covering of minute, appressed, buff-yellow hairs less noticeable; ground-colour of dorsum of abdomen is usually darker, being dark brown or brownish instead of tawny-ochraceous or ochraceous: the series of oblique, pale marks on dorsum of abdomen, outside admedian stripes, usually takes the form of clearly defined light grey spots, which are often distinctly ovate in shape, in which case they may not reach hind margins of segments on which they are situated; and, lastly, that ground-colour of all femora, and not merely of those of front legs, is black.

Abyssinia and the East Africa Protectorate: type of variety, "caught in tent in daytime," and one other specimen, "caught on camel in daytime," from Hawash Valley, Abyssinia, 30. viii. 1908 (*Dr. R. E. Drake-Brockman*); two additional specimens from Laga Hardin, Abyssinia, "caught in tent," 3, 8. ix. 1908 (*Dr. R. E. Drake-Brockman*); a fifth specimen from the East Africa Protectorate, between Lake Rudolf and the boundary of Abyssinia, January-February, 1910 (*N. C. Cockburn*). By the courtesy of Baron J. M. R. Surcouf, the author has been enabled to examine an additional example of this variety, from Gondar, Abyssinia, 10. ii. 1907 (*H. Latham*), now in the collection of the Museum National d'Histoire Naturelle, Paris.

The variety described above was formerly referred to by the author (*loc. cit.* p. 293) as a "species." The entire absence of plastic differences, however, as well as the, in some respects, intermediate character of the recently acquired specimen from the East Africa Protectorate (in which, though all the femora are black, the hairy covering of the dorsum of the thorax and the shape of the outer greyish abdominal markings are as in the typical *T. kingi*), seems, on further consideration, scarcely to justify this view.

*Tabanus selousi*, sp. n.

♀.—Length (1 specimen) 12 mm.; width of head 4.2 mm.; width of front at vertex 0.5 mm.; length of wing 9.75 mm.

*Resembling and allied to T. laverani*, Surcouf (? *T. unilineatus*, *Lw.*), but distinguished by the shape and considerably



greater breadth of the median stripe on the dorsum of the abdomen, by the stripe being interrupted (concealed by minute black hairs) on the anterior portion of the second segment, and by the pale border on each side of the dorsum of the abdomen being narrower.

Head whitish-grey pollinose, face, jowls, and basioccipital region clothed with whitish hair; front of moderate breadth, inner margins of eyes bordering it converging slightly below; *frontal callus* mummy-brown, oblong, longer than broad, and close above it in middle line an upwardly directed, dark brown, elliptical callus, marked with a median groove; *palpi* greyish ochraceous-buff, proximal joint clothed with whitish hair, terminal joint viewed from side rather broad at base, tapering to a fairly sharp point at distal extremity, clothed above and on outer side with minute, shining, whitish or yellowish-white hairs, interspersed with minute black hairs; first and second joints of *antennæ* ochraceous-buff (third joint missing in case of type). *Thorax* as in *T. lacerani*. *Surconf* (dorsum seal-brown, thinly clothed with greyish pollen, and with sides and two broad admedian stripes, commencing on front margin and meeting at tip of scutellum, grey pollinose and clothed with pale yellowish or whitish hair; *pleuræ* and *pectus* grey, clothed with whitish hair). *Abdomen*: dorsum chestnut-brown, darker on fourth and following segments, with a whitish-grey pollinose median stripe, which extends from base of first to hind margin of fifth segment, and on third and two following segments is composed of a series of truncate triangles, each of which has its base resting on the hind margin of its segment, and its forwardly directed apex cut off by the hind margin of the preceding segment; the triangles on the third and fourth segments are rather broad, and their bases approximately equal in length, while the base of the triangle on the fifth segment is conspicuously shorter, so that on that segment the stripe appears to be suddenly narrowed; on second segment, where stripe is constricted in middle and, except at extreme base and on distal half, concealed by minute black hairs, stripe is much narrower than on distal halves of two following segments; on first segment base of stripe takes the shape of a median blotch, which, anteriorly as broad as scutellum, tapers to hind margin; except where covered on second segment with minute black hairs, the stripe is clothed with minute, appressed, pale yellowish hairs (on hind margin of first segment in middle line the pale yellowish hairs are somewhat longer): sixth segment with a very narrow, almost

linear, drab-grey median stripe, inconspicuous by comparison with the truncate median triangles on the third, fourth, and fifth segments; extreme hind margins of second and following segments drab-grey; lateral borders of dorsum buff, clothed with whitish-grey pollen and silvery-white hair, and narrowing from base to tip; dark area of dorsum clothed with minute black hairs; ventral surface of first six segments ochraceous-buff, clothed with minute, appressed, pale yellowish hairs, fifth and sixth segments with a dark greyish blotch on each side; ventral surface of seventh segment dark grey, clothed with the usual, erect, coarse black hairs, and with minute, appressed, pale yellowish hairs on each side. *Wings* with a faint sepiaaceous tinge, anal cell raw-umber-coloured: veins mummy-brown, rather coarse-looking; *stigma* long, mummy-brown, sharply defined and conspicuous. *Squamæ* sepia-coloured, fringed with minute, pale yellowish hairs. *Halteres*: knobs yellowish-white, stalks buff. *Legs*: femora and tibiæ cinnamon-coloured, light grey pollinose, and clothed with pale yellowish or whitish hair; distal halves of front tibiæ brown, hind femora mouse-grey above and at base; front tarsi clove-brown, second, third, and fourth joints considerably expanded; middle and hind tarsi dark brown, extreme base of second and following joints, and first joint except tip cinnamon-coloured.

Anglo-Egyptian Sudan: Bahr-el-Ghazal, about thirty miles west of Rumbek, "on or near the Khor Gorman, in the neighbourhood of Yel's village," 18.iii.1911 (*F. C. Selous*).

It may be mentioned that it would seem probable that *Tabanus laverani*. Sureouf, to which reference is made in the diagnosis of the species described above, is in reality *T. unilineatus*, Lw., but that the description of the latter (Ber. Akad. Wiss. Berlin, 1852, p. 658) is so incomplete as to render absolutely certain determination impossible. *T. laverani* was met with by Mr. Selous in some numbers at the same place and on the same date as the type of the species just described, and was also found plentifully at other localities in the vicinity. Although *T. laverani* was formerly regarded as a purely West African species, the Museum collection now includes specimens of it from the Bahr-el-Ghazal, Nyasaland Protectorate, and Portuguese East Africa, besides others from the localities in West Africa recorded by the present writer in his 'Illustrations of African Blood-sucking Flies' (1909).

*Tabanus xanthomelas*, nom. nov., for

*Tabanus leucaspis*, v. d. Wulp, 'Notes from the Leyden Museum,' vol. vii. p. 74, pl. 5. fig. 3 (1885) (*nec* Wiedemann, 1828)—nomen bis lectum.

Material received from various parts of Africa during the last two years shows that *Tabanus leucaspis*, v. d. Wulp (*nec* Wied.), which was formerly considered by the present writer to be identical with *T. pluto*, Walk.\*, is after all distinct from that species. The name *leucaspis* having previously been employed by Wiedemann for a *Tabanus* from Brazil, the designation of van der Wulp's species must be changed.

*Tabanus xanthomelas* can be distinguished from *T. pluto*, Walk., by its abdominal markings. In the case of the former species, the yellowish area, clothed with chrome-yellow hairs, on each side of the dorsal surface of the abdomen terminates abruptly on the hind margin of the third segment, while in that of the latter the corresponding area is continued on to the fourth segment, usually as far as the hind margin, and sometimes even extends on to the fifth segment. In *T. pluto*, too, the black median longitudinal stripe separating the two yellow areas is much broader and has sharply defined edges, while in *T. xanthomelas* the intervening stripe is less than half the width of that in *T. pluto*, besides being more or less ill-defined and incomplete, the areas clothed with chrome-yellow or Naples-yellow hair having a marked tendency to fuse together. In fact, in well-preserved specimens of *T. xanthomelas*, the median stripe may be reduced to a triangular or elongate black spot on the hind margins of the second and third segments, or even to a single spot on the hind margin of the former segment.

*Tabanus xanthomelas*, the type of which was stated to be from the Gold Coast, is represented in the National Collection by specimens from Portuguese Congo, the Congo Free State, the Anglo-Egyptian Sudan (Mongalla Province), and the Uganda and Nyasaland Protectorates. *Tabanus pluto*, Walk., the Museum examples of which are from Sierra Leone and the Sierra Leone Protectorate, Liberia, and Northern and Southern Nigeria, would, so far as present knowledge goes, appear to be purely West African.

\* Cf. Austen, 'Illustrations of African Blood-sucking Flies,' p. 92 (1909).

*Tabanus producticornis*, sp. n.

♀.—Length (1 specimen) 11.6 mm.; width of head 4 mm.; width of front at vertex just under 1 mm.; length of antennæ 2.4 mm. (length of third joint 1.6 mm.); length of wing 10.2 mm.

*Rather small species, with abnormally long and slender third antennal joint.*—Front broad, inner margins of eyes bounding it almost parallel, diverging very slightly below; frontal callus very large, prominent, shining clove-brown, quadrate in outline when viewed from in front, except that its upper margin is produced in middle line into an upwardly directed angle; dorsum of thorax greyish olive, unstriped; dorsum of abdomen blackish slate-coloured, cinnamon-rufous on each side at base, hind borders of all segments cream-buff or greyish cream-coloured pollinose; wings hyaline, costal cells and stigma mummy-brown, anterior branch of third longitudinal vein angulate at base and provided with a backwardly directed appendix.

*Head:* front only about two and one-third times as long as broad, buff pollinose above callus, subcallus cream-buff pollinose; face, jowls, and basioccipital region whitish grey, clothed with white hair; occiput smoke-grey; frontal callus in contact with eye on each side below; palpi cream-coloured, first joint clothed below with long white hair, terminal joint remarkably small, acuminate, clothed on outer side with appressed, silvery-white hairs, interspersed towards tip with minute black hairs; first joint of antennæ long, ochraceous-rufous (ochraceous-buff at base), upper distal angle not produced; second joint of antennæ short, also without a prominent upper distal angle; third joint remarkably long, narrow, and almost straight, expanded basal portion ochraceous-rufous, as viewed from the side the upper and lower margins of its proximal extremity almost parallel, the angle on the upper margin of the expanded basal portion not prominent, situate just before the middle of this section of the joint; terminal annuli of third joint clove-brown, styliform, together about one and a half times as long as expanded portion of joint; last annulus especially elongate, about three-quarters as long as the three preceding annuli taken together. *Thorax:* dorsum clothed with fine, erect, blackish hair, mixed with ochre-yellow hairs; dorsal surface of scutellum grey, olivaceous at base; pleuræ and pectus light grey, clothed with white hair. *Abdomen:* dorsal surface of first three segments, except hind borders, cinnamon-rufous on each side; lateral borders of dorsal



scutes (invisible from above) buff, narrowing from base of abdomen to distal extremity, and clothed with white or yellowish-white hair; posterior angles of fourth, fifth, and sixth segments clothed with yellowish hair; ventral surface greyish cream-buff, clothed with appressed yellowish or whitish hair (seventh segment mouse-grey, clothed with black hair), hind borders of third to fifth segments inclusive cream-coloured pollinose. *Wings*: veins dark brown or mummy-brown; stigma elongate, somewhat darker than costal cells, the latter together with the stigma constituting an abbreviated coloured border, which forms a conspicuous contrast with the colourless remainder of the wing. *Squæ* light drab. *Halteres*: knobs cream-buff, somewhat darker at base; stalks ochraceous-buff. *Legs*: coxæ grey, clothed with white hair; femora and tibiæ cinnamon, femora clothed with white hair and more or less grey at base, under surfaces and distal extremities of front tibiæ dark brown or brownish; front tarsi not expanded, clove-brown (first joint dark brown); last two joints and tips of first three joints of middle and hind tarsi dark brown, remainder of middle and hind tarsi cinnamon.

Portuguese East Africa: Umbelusi River, 20 miles south of Lorenzo Marques, December 1910 (*C. W. Howard*).

The awl-like shape and relatively great length of the third joint of the antennæ give this species an altogether unusual appearance, and will alone suffice to prevent confusion with any other African *Tabanus* at present known.

*Tabanus minuscularius*, sp. n.

♀.—Length (2 specimens) 8·6 to 10 mm.; width of head 3 to 3·6 mm.; width of front at vertex 0·75 mm.; length of wing 7·2 to 8·2 mm.

*Small, dusky species, with conspicuously grey-striped thorax, and dorsum of abdomen marked with an ill-defined, yellowish-grey, median, longitudinal stripe, and, midway between this and lateral margin on each side, a sharply defined and sometimes broader stripe of lighter grey, more or less distinctly composed of a series of elongate spots.*

*Head*: front yellowish-grey pollinose, parallel-sided, relatively rather broad (its length about two and one-half times its breadth), subcallus cream buff pollinose, ground-colour of subcallus ochraceous-buff; face, jowls, and basi-occipital region whitish grey, clothed with white hair; occiput grey, posterior orbits yellowish grey; *frontal callus*

shining clove-brown, transversely oblong, extending from eye to eye; on vertex is a shining black transverse mark, also extending from eye to eye, and perhaps partly due to rubbing; midway between mark on vertex and callus is a dull, clove-brown or black, transverse band, of approximately same size as callus, and extending from eye to eye; *eyes banded*; *palpi* cream-buff or cream-coloured, proximal joint somewhat greyish and clothed with white hair, terminal joint viewed from the side curved lanceolate, clothed on outer side with minute, appressed, shining yellowish-white hairs, mixed with minute black hairs; first and second joints of *antennæ* ochraceous-buff, short, clothed with short, black hairs, their upper distal angles not produced: expanded portion of the third joint of *antennæ* ochraceous-rufous, viewed from side sometimes rather broad, terminal annuli of third joint clove-brown (the three proximal annuli sometimes paler). *Thorax*: dorsum dark olive-brown, greyish in front, thinly clothed with minute, appressed, shining buff-yellow hairs mixed with some blackish hairs, light grey on each side from humeral callus to scutellum, with three narrow, light grey, longitudinal stripes, and on each side a shorter and broader grey stripe, which extends from posterior margin of triangular depression at end of transverse suture to postalar callus; the three light grey stripes in the centre all start from the front margin, but while the median stripe becomes indistinct beyond the transverse suture, the paired stripes (which posteriorly, at any rate, are somewhat broader than the median one) are entire; dorsal surface of scutellum grey on each side, more or less olive-brown in centre, its hairy covering similar to that of remainder of dorsum; swelling occupying triangular depression at each end of transverse suture isabella-coloured, clothed below with longer dark brown or black hair, and above with short yellowish hair; *pleuræ* and *pectus* light grey (meso- and sternopleuræ sometimes with traces of isabella-colour), clothed with whitish hair. *Abdomen*: dorsum dark olive-brown, clothed on each side and on median stripe with minute, appressed, yellowish hairs, extreme hind margins of all segments, except first, yellowish-grey pollinose; first segment grey on each side; midway between median line and lateral margin is, on each side, a longitudinal series of elongate grey spots, each spot with its base resting on the hind margin of the preceding segment, the two series thus forming a pair of grey stripes (considerably broader than the stripes on the thorax), which, commencing at the base of the second segment, terminate on the sixth segment

before reaching the hind margin, though, when the abdomen is viewed at a low angle from behind, a small grey spot, representing the end of the corresponding stripe, is sometimes indistinctly visible on the seventh segment, on each side of the middle line: the inner edge of the spots on the second, third, and fourth segments is somewhat oblique, and the spots on the fourth and fifth as well as those on the subsequent segments may not reach the hind margins; median stripe continuous, deeper in colour, less clearly defined, and sometimes narrower than the grey stripes just described, commencing at base of abdomen and dying away on sixth segment; venter light grey, clothed with minute, appressed, yellowish hairs, hind margins of segments cream-buff. *Wings* hyaline, costa dark brown, other veins mummy-brown; *stigma* elongate, mummy-brown or raw-umber-coloured. *Halleres*: knobs cream-coloured, stalks somewhat darker. *Legs*: coxæ grey, clothed with whitish hair; front femora slate-grey, clothed with appressed whitish hair, mixed with longer, erect, black hairs; middle and hind femora isabella-coloured or drab, with a dark grey or dark greyish-brown band on distal third; tibiæ buff, clothed (except tips of front tibiæ and posterior surface of tips of hind tibiæ) with minute, appressed, glistening yellowish-white hairs, distal fourth of front tibiæ clove-brown, tips of hind tibiæ brown; front tarsi clove-brown, three middle joints slightly expanded; middle and hind tarsi seal-brown or dark mummy-brown, first and second joints of hind tarsi, except tips, sometimes paler.

Portuguese East Africa: Umbelusi River, 20 miles south of Lorenzo Marques, December 1910 (*C. W. Howard*).

In size and general appearance the species described above, which belongs to Surcouf's "Thirteenth Group," is not unlike the typical form of *Tabanus sufis*, Jaenn., although distinguishable, *inter alia*, by the front being of uniform breadth, instead of noticeably wider above; by the much darker coloration of the frontal callus, &c.; by each of the paired grey abdominal stripes being practically continuous, instead of broken up into a series of oblique spots; by the wings having a distinct stigma; by the anterior branch of the third longitudinal vein not being angulate nor provided with an appendix at the base; and by the wings lacking the conspicuous infuscation of certain veins or portions of veins that is characteristic of *T. sufis*.

II.—*New Species of Heterocera from Costa Rica*.—XII.  
By W. SCHAUS, F.Z.S.

Syntomidæ.

*Loxophlebia peralta*, sp. n.

♂. Palpi black. Head and collar black-brown; some white scaling on frons. Thorax and abdomen blue-black; some brown dorsally on abdomen at base; a large crimson spot on patagia. Legs black-brown; some white irrorations on fore coxæ and tarsi inwardly. Wings hyaline; veins, base, and margins black, expanding at apex and tornus; the discocellular rather broadly black. Hind wings: veins and margins black, widest at apex.

Expanse 26 mm.

*Hab.* Peralta, Tuis.

*Loxophlebia flavipicta*, sp. n.

♂. Palpi and vertex black; frons white. Thorax and abdomen orange-yellow; a large spot dorsally on middle of abdomen and last two segments black, both with a few dark metallic scales. Legs yellow, part of tibiæ and tarsi brown. Wings hyaline. Fore wings: base yellow, followed by a black spot on inner margin, and a black streak on costa to discocellular, which is also rather broadly black; a black spot at tornus; apex black; costa postmedially, outer margin from vein 2 to near 4, and inner margin medially bright yellow, also veins 3-6 from just beyond cell; median and vein 2 black. Hind wings: veins and inner margin to beyond vein 2 yellow, with a black streak at anal angle and black at base of vein 2; apical part of outer margin broadly black.

Expanse 20 mm.

*Hab.* Tuis, Sixola.

*Chrostosoma patricia*, sp. n.

♀. Palpi and legs brown-black. Frons metallic blue; vertex black, irrorated with blue. Collar and thorax black-brown; a blue spot on tegulæ and on meso- and metathorax; a crimson spot on shoulders. Abdomen above black, with subdorsal crimson spots at base and lateral metallic-blue spots; ventrally white. Coxæ with white spots, the fore coxæ opalescent white. Wings hyaline, the veins black.



Fore wings: a broad medial black band, expanding along inner margin to tornus; an apical black patch from just below vein 5. Hind wings: the outer margin broadly black at apex, narrowing to anal angle.

Expanse 29 mm.

*Hab.* Sitio, Juan Vinas.

*Chrostosoma fumosa*, sp. n.

♂. Body black; a crimson spot on shoulders, on patagia, and dorsally on abdomen at base. Fore wings semihyaline, smoky brown; the veins and cilia black; the outer margin narrowly suffused with black. Hind wings semihyaline black.

Expanse 25 mm.

*Hab.* Sixola.

*Cosmosoma galbana*, sp. n.

♂. Palpi, frons, and antennæ brown; vertex black. Collar, thorax, and abdomen yellow; last segment black, expanding dorsally on previous segment. Legs chiefly light brown; coxæ yellow; hind tarsi yellowish buff. Wings hyaline; some yellow at base, followed by black; veins and outer margins black, expanding at apices and at tornus.

Expanse 33 mm.

*Hab.* Juan Vinas, Sitio.

*Cosmosoma thia*, sp. n.

♂. Palpi, head, collar, thorax, and legs dark brown; some metallic-blue shadings on frons and tegulae; the coxæ shaded with blue-black. Abdomen bright yellow, the last two segments black. Wings hyaline; the veins and margins black, expanding at apices and at tornus; a rather heavy angled black line on discocellular.

Expanse 29 mm.

*Hab.* Juan Vinas, Sitio.

*Cosmosoma galatea*, sp. n.

♂. Palpi, collar, thorax, and legs black; frons white; two white spots on vertex; white spots on tegulae and patagia; throat and base of fore coxæ white. Abdomen deep yellow; last four segments above black, shaded with steel-blue; below only last two segments black. Wings hyaline, the veins and margins black. Fore wings: the

base black; the apex and termen along vein 2 more broadly black.

Expanse 29 mm.

*Hab.* Juan Vinas, Guapiles, Tuis.

Belongs near *zucheri*, Dr., having the ventral valve and black thorax, but otherwise very different.

*Saurita improvisa*, sp. n.

♀. Head black, the frons irrorated with whitish-grey hairs, and an angled line of similar hairs on vertex. Tegulae black, edged with whitish grey. Thorax orange, some black, with a white spot anteriorly; patagia black. Abdomen orange; a black band at base, interrupted dorsally. Legs fuscous brown, faintly streaked with white. Wings brownish hyaline, thinly scaled on outer third; veins and cilia fuscous brown.

Expanse 24 mm.

*Hab.* Juan Vinas.

Allied to *Saurita ochracea*, Feld.

Arctiadæ.

Subfamily *NOLINÆ*.

*Nola maia*, sp. n.

Head, collar, and thorax dark brown. Abdomen greyish brown. Fore wings: basal half brown; cell-tufts violaceous black; a faint whitish, antemedial, perpendicular line from within cell; outer half lighter brown, especially before post-medial, which is fine, white, edged with dark brown, out-curved beyond cell and again on submedian; a deeply wavy subterminal dark brown shade outwardly edged with white scales. Cilia brownish, with dark irrorations and some whitish scales at base. Hind wings whitish, shaded with grey terminally. Hind wings below whitish, irrorated with olive-brown; a black discal spot; a broad postmedial dark line; a fine terminal line.

Expanse 23 mm.

*Hab.* Poas.

*Nola sperata*, sp. n.

♀. Palpi brown, broadly tipped with white. Head, collar, and thorax white, irrorated with black. Abdomen fuscous grey, with white segmental lines. Fore wings white, with a few fuscous-brown irrorations; cell-tufts

brown, edged with white; base of costa brown, followed by a small brown spot from which the fine black antemedial line starts and is angled in cell, wavy below it, and much thickened just below median; a fuscous medial line outwardly oblique, punctiform below discocellular, followed on costa by a triangular grey-brown spot; postmedial line, brown, out-curved beyond cell, with velvety black spots on veins; sub-terminal brown spots, outwardly oblique from costa, and confluent on costa and above inner margin, the spot on vein 5 inset; terminal brown shade with white spots between veins. Hind wings grey, darkest terminally; a fuscous spot on discocellular.

Expanse 22 mm.

*Hab.* Juan Vinas, Zent.

*Nola biumbrata*, sp. n.

♀. Palpi grey, with dark irrorations laterally. Body lilacine grey; whitish segmental lines on abdomen. Fore wings brownish grey, thinly irrorated with dark brown; lines dark brown, broad; antemedial angled in cell, close to dark cell-spot and inwardly oblique to inner margin; a dark medial shade on costa; postmedial lunular, dentate, from below costa to middle of inner margin; a faint subterminal line indicated by irrorations. Hind wings whitish grey, thinly scaled; a faint fuscous line on discocellular and indistinct postmedial points on veins.

Expanse 23 mm.

*Hab.* Juan Vinas.

*Nola artata*, sp. n.

♂. Palpi light brown. Head, collar, and thorax white; some dark irrorations on head and shoulders. Abdomen whitish grey. Fore wings whitish grey, with a few dark irrorations forming indistinct antemedial and postmedial lines; base of costa and a spot medially dark brown and three dark points towards apex; the termen shaded with brown; terminal dark streaks between veins 4 and tornus. Hind wings fuscous grey.

Expanse 13 mm.

*Hab.* Tuis, Juan Vinas.

Allied to *N. apera*, Druce, but without the distinct post-medial row of spots.

Subfamily *ARCTIANÆ*.*Phæomolis lepida*, sp. n.

♀. Palpi yellow, tipped with fuscous grey, and streaked above with fuscous grey edged with red. Head yellow; an outcurved dark line across vertex. Collar yellow, partly dark edged in front. Thorax dark red, with yellow spots, irregularly yellow in front; patagia with a large lilacine grey spot, edged with dull red. Abdomen crimson above, with some yellow at base, white underneath. Legs outwardly yellow, with red-edged grey spots at joints. Fore wings yellow; the basal third and inner margin to tornus dark lilacine grey, cut by red veins, leaving the extreme costa yellow; a subbasal triangular yellow space from costa across cell, enclosing a small dark spot; an antemedial oblique line below submedian, joining on inner margin a fine yellow medial line inbent from vein 2, inset and angled at cell and vein 2, and forming a small spot in cell; all the yellow portions separated from the dark portions by fine red edgings; dark red-edged spots at end of cell and a streak on subcostal, followed by four small spots from veins 3-8; an outer row of larger spots, geminate above vein 6, suffusing between 5 and 6 into an elongated spot, all more or less edged with red; smaller irregular marginal spots between the veins tipped with red. Hind wings roseate; a fuscous shade on anal half of outer margin.

Expanse 40 mm.

*Hab.* Juan Vinas, Tuis, Sixola, Avangarez.

*Halisidota cinctipes fumosa*, subsp. n.

♂. Palpi and frons black. Vertex, collar, thorax, and fore wings fawn-colour; collar behind, thorax medially, and patagia dorsally edged with green; a black streak on patagia; abdomen ochreous buff above, with lateral black spots; body below fawn-colour, the legs with black spots. Fore wings: markings light brown, edged with black; the veins black where crossing spots; a basal and antemedial spot on costa, connected by streaks on subcostal, in cell, and on median nervure, also a triangular spot below cell, not reaching base nor extending below submedian; a sinuous medial band crossed by black streaks in cell and on fold; a U-shaped, black-edged, ochreous discocellular spot and a small spot on costa above it; irregular subterminal spots from vein 3 to inner margin and from 4 to 7; irregular terminal spots; all



the costal spots tinged with ochreous. Hind wing semi-hyaline whitish fawn, clouded with fuscous, chiefly along inner margin; cilia mostly black from vein 2 to anal angle.

Expanse 50 mm.

*Hab.* Sixola, Juan Vinas.

The specimen from Juan Vinas has an antemedial black point on inner margin; the medial band expands in cell and suffuses with discocellular spot, and the subterminal spots are connected by a spot between veins 3 and 4.

*Virbia fluminea*, sp. n.

♂. Head and body above dark brown; legs greyish brown; abdomen below dark grey; some crimson laterally on neck and below head; a lateral yellow spot on thorax below. Fore wings above dark brown; underneath with a large yellow median spot not reaching costa. Hind wings above black; a large postmedial yellow spot from costa to just below vein 3, its inner edge straight, and leaving the outer margin rather narrowly black. Underneath duller black; the spot as above; some yellow at base of costa.

Expanse 25 mm.

*Hab.* Sixola River.

Allied to *V. subapicalis*, Wlk.

**Lymantriadæ.**

*Turuenna electa*, sp. n.

♂. Palpi brownish grey, tipped with white. Head, collar, and thorax roseate grey. Abdomen roseate above, greyish brown underneath. Wings brownish grey. Fore wings: the base tinged with roseate; antemedial space tinged with olive-brown and crossed by a faint lilacine shade, limited by a fine dark line, incurved from fold to inner margin; medial space tinged faintly with lilacine; a dark shade at end of cell, followed by a brownish shade from costa to inner margin; the postmedial line fine, olive-brown, incurved on costa, angled at vein 7 and straight to inner margin, inwardly shaded with lilacine; apical third of costa brown; a subterminal dark sinuous line. Underneath lilacine grey, the inner margin broadly whitish grey, traces of postmedial and subterminal lines on fore wings. Hind wings: the costal margin rather darker; a broad postmedial brown shade from costa to end of cell, followed by a fine lunular wavy line not reaching inner margin, and a subterminal shade from vein 6 to anal angle.

Expanse 42 mm.

Female: Head, collar, and thorax lilacine; a medial dark line. Abdomen roseate buff. Fore wings: the dark portions olive-brown, tinged with reddish on apical area; the base, antemedial shade, a broad shade beyond medial line, and narrow shades before postmedial and subterminal lines, also the termen, distinctly lilacine. Hind wings roseate buff; traces of an interrupted dark subterminal shade. Wings below buff, heavily shaded with lilacine, the postmedial shades and lines, also the outer margins, especially of fore wings, violaceous.

Expanse 58 mm.

*Hab.* Cartago, Juan Vinas.

*Turuenna festiva*, sp. n.

♂. Palpi dark brown, shaded above with buff. Head, collar, and thorax dull buff, with a medial darker shade. Abdomen roseate ochre above; a fuscous dorsal line; underneath dark violaceous. Fore wings: the base greyish buff, followed by a broad dull olive shade inwardly oblique from costa; the antemedial space darker than the base and crossed by a fine dark line; a distinct medial olive-brown line, somewhat incurved, followed by a dark buff space expanding to postmedial below vein 4, crossed by a vague olive shade, which is broad and darker from vein 4 to costa; the apical area also dull olivaceous; a black discal point; the postmedial line distinct, fine, dark olive, oblique from costa and angled at vein 7; the subterminal line sinuous, shaded with buff from vein 5 to inner margin. Hind wings: the costal half fuscous; the inner half yellowish buff. Fore wings below yellowish buff; the costa and a broad postmedial shade from vein 6 to costa violaceous, the latter followed by a dark curved line from costa to vein 4; the apex lilacine. Hind wings below: above median and vein 3 dark lilacine, with broad postmedial violaceous shade and a fine dark line; below cell and vein 3 yellowish buff; traces of an interrupted subterminal line.

Expanse 36 mm.

Female: Abdomen ochreous. Fore wings lilacine; the lines fine, dark olive-brown; the shadings olive-brown, not so heavy as in the male. Hind wings yellowish buff; an indistinct postmedial line and a subterminal row of black spots. Underneath brownish buff, with the dark shadings much reduced. Fore wings: the outer margin shaded with purplish; the lines visible, the subterminal straight, not

sinuous. Hind wings: the postmedial shade very narrow on costa, followed by a faint line; subterminal black spots as above.

Expanse 51 mm.

*Hab.* Juan Vinas, Tuis, San José.

### Lasiocampidæ.

#### *Claphe braganzoides*, sp. n.

♂. Body brown; a white patch laterally on tegulæ and patagia. Fore wings white, irrorated with brown above cell; a subbasal triangular brown spot on costa and cell; an interrupted geminate antemedial brown line; two dark points on discocellular; a geminate postmedial line outcurved below costa, the outer portion terminating at vein 3; inner margin brown, separated from white space by a darker brown shade; outer margin below vein 4 brown from postmedial line, narrowly brown from 4 to just above 6; an elongated brown spot on costa beyond postmedial; subterminal dark brown spots, outwardly edged by a lunular white line, obsolescent between 2 and 3; cilia dark brown, with white points at veins. Hind wings brown; the costa broadly white, not reaching termen, irrorated and crossed by brown lines. Underneath brown; subterminal whitish lines near apices.

Expanse 35 mm.

Female: Fore wings white, thinly irrorated with brown; the inner margin and termen narrowly brown; a brown spot on costa towards apex; an inbent geminate brown line from vein 3 to inner margin; subterminal brown spots outwardly edged by a broad lunular white shade. Hind wings with the costal white area without lines and slightly irrorated with brown.

Expanse 44 mm.

*Hab.* Tuis, Sixola.

Allied to *C. braganza*, Schs.

#### *Claphe phedonioides*, sp. n.

♂. Head, collar, and patagia mottled brown and grey. Thorax and dorsal spot at base of abdomen fuscous brown. Abdomen ochreous buff. Fore wings whitish grey, thinly irrorated with brown; postmedial white streaks on veins, preceded by dark brown streaks, and an oblique brown shade on costa; the veins on terminal third more heavily irrorated with brown; a subterminal, deeply dentate, dark grey line;

cilia brownish, with indistinct white spots; a medial fuscous spot on inner margin. Hind wings similar, the inner margin broadly ochreous brown; a faint medial fuscous line.

Expanse 37 mm.

*Hab.* Juan Vinas, Tuis.

Allied to *C. phedonia*, Stoll, but smaller, paler, and with the wings less produced.

*Claphe juliana*, sp. n.

♂. Body and fore wings dark fuscous grey, faintly tinged with brown; hind tarsi whitish. Fore wings: a black spot at end of cell; a fine, dark, antemedial, slightly curved line, marked with whitish buff on costa; a postmedial faintly darker shade marked with whitish buff on costa and inner margin; a similar pale shade at tornus. Hind wings greyish white; the veins finely dark grey; the costal and inner margins broadly fuscous grey, tinged with brown, crossed by a postmedial pale shade.

Expanse 42 mm.

*Hab.* Sixola.

Closely allied to *C. julia*, Schs., but larger, and with lines of fore wing more obsolete.

*Titya perplexa*, sp. n.

♂. Body whitish buff, with brown shades on head, collar, and posterior half of abdomen dorsally; the anal hairs dark brown. Fore wings buff-brown; the basal third of veins and inner margin whitish, more thickly scaled and irrorated with brown; a fine medial and postmedial brown line, almost touching on submedian; the postmedial outcurved below costa and followed by a fine geminate parallel brown line; the apex suffused with fuscous; the subterminal space from vein 8 to submedian rather broadly whitish; a terminal white line; a black point at end of cell. Hind wings whitish buff, darkest along inner margin; an indistinct postmedial brownish shade, expanding below vein 4.

Expanse 28 mm.

♀. Body greyish buff, the thorax, base of abdomen dorsally, and anal hairs tinged with light reddish brown. Fore wings grey: an antemedial brown line, outbent from subcostal to inner margin, followed by a fine lilacine white line; a large dark brown patch in cell, and a still broader dark brown space from cell to inner margin, the latter space shaded with dull red close to cell, and limited by a whitish line below cell; a dark point at end of cell; the postmedial space



to subterminal shaded with lilacine brown and crossed by darker semilunar spots forming a line; the subterminal whitish, inangled at vein 5; apical black spots between 8 and 10; a terminal white line. Hind wings buff-grey, faintly darker postmedially; veins and cilia light brown.

Expanse 37 mm.

*Hab.* Sitio, Tuis.

Closely allied to *T. nana*, Dr., the male tinged with brown instead of grey, the female having the dark space in cell.

### Saturniadæ.

#### *Copaxa curvilinea*, sp. n.

♂. Head black. Collar whitish grey. Thorax, abdomen, and wings dull brown. Fore wings: costa to beyond middle greyish buff; faint traces of a dark antemedial line; a round hyaline spot at end of cell, outwardly edged by a black and ochreous line; a fine dark line from vein 7 near termen, incurved to inner margin beyond middle, outwardly edged with whitish lilacine from vein 6; the outer margin very faintly tinged with lilacine. Hind wings: a dark straight antemedial line; a smaller hyaline spot more broadly edged with ochreous; a postmedial dark brown shade, followed by whitish lilacine streaks and black points on veins, the latter connected by a faint dark lunular line; subterminal whitish points on veins.

Expanse 102 mm.

*Hab.* Guapiles, Sixola.

#### *Gamelia musta*, sp. n.

♂. Palpi brown; a lateral black streak. Frons reddish brown; vertex, collar, and thorax brown, the patagia tinged with reddish. Abdomen above fuscous, shaded with dark brown dorsally. Body below bright reddish brown. Fore wings: basal third dark reddish brown, limited by a fuscous-brown shade, divided by buff irroration, inset below cell, and then outcurved; wing otherwise brownish, strongly tinged with lilacine; a buff line, edged on either side with black from apex to inner margin near tornus; a bright small ochreous spot at end of cell, crossed by a fine dark line; a reddish-brown subterminal shade towards costa before line. Hind wings greyish buff, dark-shaded along inner margin; ocellus large, crimson, containing a white spot, and broadly edged with black, which is sharply produced towards outer

margin across a fuscous-grey outer curved line; a sub-terminal fuscous shade from apex, expanding towards inner margin, but well above anal angle; outer margin brown, tinged with lilacine. Fore wings below pale roseate brown; a large black spot at end of cell; the outer line indistinct, fuscous, faintly geminate. Hind wings below bright reddish brown, darkest on outer margin; a lilacine straight line, outwardly shaded with dark reddish brown from termen at vein 6 to inner margin at two-thirds from base; a black point at end of cell.

Expanse 68 mm.

*Hab.* Juan Vinas.

*Oxytenis albilunulata*, sp. n.

♂. Head, thorax, and fore wings dark violaceous brown. Abdomen above fuscous brown. Body brownish buff below. Fore wings: the costa arched, slightly produced at apex; a fine darker antemedial line, irregularly outcurved to middle of inner margin; black points shaded with white at end of cell; a fuscous postmedial shade angled between 6 and 7; a fine reddish-brown line from costa near apex to inner margin well beyond middle, followed by a subterminal fine lunular white line and marginal whitish irrorations from vein 5 to tornus, partly interrupted by dark spots; a white line along base of cilia. Hind wings brighter, irrorated with whitish except on costal and anal area; the costa buff-brown; the reddish-brown line of fore wing continued to middle of inner margin; a dentate black postmedial line; subterminal black spots. Wings below buff-brown, palest at base; the veins clear buff; a subterminal black shade, reaching apex on fore wings; some marginal black spots on hind wings.

Expanse 52 mm.

*Hab.* Carillo, Sitio.

The specimen from Sitio is light brown, the marginal lunules and irrorations less distinct, but evidently represents the same species.

*Dysdemonia nobilis*, sp. n.

♂. Palpi, head, tibiae, tarsi, and part of fore coxæ dark brown. Collar and thorax greenish grey. Abdomen above greyish. Fore wings even more produced than usual and deeply crenulate below vein 5, greenish grey; an outwardly oblique broad green antemedial shade from below cell, followed by a similar medial shade from costa faintly edged with darker green; an almost round hyaline spot on outer

side of discocellular, with a dark brown spot above it and one below it, the same size as the hyaline spot; a minute hyaline spot follows the upper brown spot; a broad postmedial green shade, slightly indented and not quite touching the lower brown spot; an outer fine fuscous line outcurved below costa and almost perpendicular from vein 4, followed above vein 2 by a large olive-green spot and below vein 2 to inner margin by smaller spots, all edged with whitish irrorations; a cluster of whitish irrorations between 3 and 4; a larger olive-green elongated spot on costa before apex, partly edged with whitish scaling; a subterminal triangular olive-green shade below vein 7; termen below vein 5 shaded with dark green. Hind wings: the costal margin above cell and vein 6 dark brown, below cell greenish grey; a downcurved greenish shade below cell from base; a postmedial dark green shade, becoming dark brown above 6; the outer line fuscous brown, angled at vein 4, and followed from below vein 2 to inner margin by fuscous spots edged with whitish irrorations; the termen narrowly green-shaded. Underneath greenish buff; a sinuous outer line on fore wings, continued on hind wings postmedially, greenish in colour, and a faint curved outer line beyond it on hind wings.

Expanse 145-158 mm.

*Hab.* Juan Vinas, Sitio, Tuis.

### Eupterotidæ.

#### *Olceclostera bifenestrata*, sp. n.

♂. Palpi buff, streaked behind with black-brown. Head, collar, and thorax grey, with a medial brown line. Abdomen grey, thickly irrorated above with dark brown except on two terminal segments. Fore wings grey, with a few black irrorations; the costa finely buff-brown; a fine antemedial black line, punctiform on veins, outangled on median and submedian, inangled in cell and on fold, followed by a fine brownish-grey sinuous line; a minute black point on discocellular; a fuscous postmedial narrow shade, outcurved beyond cell, followed by a row of black points on veins, connected by a dark sinuous line from vein 2 to inner margin; a subterminal hyaline spot between 5 and 6 and a smaller spot below 5, both edged with brown; cilia dark brown, with buff-grey spots at veins. Hind wings fuscous brown, darkest on outer margin; a terminal greyish shade at anal angle. Wings below buff-grey. Fore wings: a black line on discocellular; a brownish postmedial line; a fine blackish

subterminal line. Hind wings: some black irrorations; a black discal point; the brown postmedial shade angled below vein 6; the subterminal finely wavy dentate.

Expanse, ♂ 43 mm.; ♀ 57 mm.

*Hab.* Avangarez, Tuis, Juan Vinas.

Allied to *O. angelica*, Grote.

*Carthara cachiana*, sp. n.

♀. Head, collar, and thorax greenish buff. Abdomen ochreous; a dark grey dorsal line and transverse black band on basal segment. Fore wings: basal third greenish buff, limited by the inner line, which is whitish, finely edged with fuscous grey, oblique to median between veins 2 and 3, angled and inwardly oblique; space to outer line greyish, tinged with green on costa, crossed by a medial and a postmedial fuscous shade; the outer line whitish, tinged with lilacine, straight to vein 4, then slightly inbent and faintly lunular between veins; the outer margin greenish from vein 5 to costa, below 5 silvery grey, leaving a greenish shade along outer line from 3 to inner margin; a subterminal brownish shade from 5 to 7; veins 5-7 terminally brownish. Hind wings dull greenish buff; the inner margin dark olive-green, crossed by a white antemedial line, and a downbent semioval white line postmedially; a fuscous postmedial shade, followed by lilacine shading from vein 2 to inner margin; the outer line lilacine white, edged with fuscous, terminating at anal angle, which is considerably produced. Wings below greenish ochre, the apical area of fore wings and outer margin of hind wings brighter; a fuscous postmedial line; the outer line whitish; a white discal spot on hind wings.

Expanse 57 mm.

*Hab.* Cachi.

*Carthara subrufa*, sp. n.

♂. Throat and palpi red, the latter tipped with buff. Frons dark brown; vertex mottled grey, brown, and red; buff hairs in front of antennae. Collar dark brown shaded with maroon in front. Thorax ochreous buff, some purplish hairs on patagia. Abdomen purplish brown. Fore wings: base mottled green-buff and lilacine; a broad dark shade from below cell to inner margin, followed by the antemedial dark greenish line, which is oblique from costa, angled on median, and outcurved from just below cell; the medial space greenish buff in cell to beyond discocellular, on which



are two black points, roseate lilacine between 2 and 4, greenish below cell and vein 2, and buff mottled with reddish brown on inner margin; a postmedial line from a dark brown spot on costa, oblique to 4, then lunular to inner margin; a fine medial dark line, also starting from a small dark brown costal spot; from postmedial to outer line the costa is ochreous and brown, the space between 6 and 8 purplish with lilacine irrorations, between 4 and 6 dark olive-green, between 2 and 4 lilacine red, and below 2 as on medial space; outer line whitish buff, obliquely lunular to vein 4 followed by dark olive-green, cut by buff veins, below vein 4, fuscous, perpendicular, lunular, followed by lilacine violaceous shadings to termen, extending narrowly to apex. Hind wings yellowish; some red hairs in cell, and a curved dark red line from base to middle of inner margin; a fine postmedial dark line, beyond which the outer space is reddish from vein 6 to inner margin, suffused with violaceous between 4 and 6, and dark shaded below 2; the inner margin narrowly maroon and black; a fuscous outer line shaded with white below vein 2. Fore wings below suffused with black on outer margin; the costa ochreous buff; the apex red; some terminal whitish irrorations between 3 and 6; the inner margin broadly yellow. Hind wings below dark red; a black streak on discocellular; a postmedial and an outer fuscous line; a broad fuscous shade irrorated with yellow medially and postmedially, from base to termen below vein 2, crossed by a whitish line subterminally; a roseate brown shade near inner margin, which is finely dark as above.

Expanse 35 mm.

Female: Fore wings lilacine brown; the antemedial and postmedial lines fuscous and rather faint; the outer line followed by a dark olive-green space from vein 4 to costa, intersected by the buff-brown veins. Apex acute and falcate. Hind wings fuscous brown. Hind wings below brown; a dark discal point; a fuscous postmedial line; the outer line fuscous, finely dentate, lunular, followed by ochreous irrorations to termen.

Expanse 53 mm.

*Hab.* Juan Vinas, Sixola.

*Carthara denticulata*, sp. n.

♂. Frons light brown. Vertex fuscous brown. Collar brown. Thorax grey-brown; fuscous shadings on patagia. Abdomen dark ochreous brown. White irrorations on vertex

and patagia. Fore wings dull greyish brown, with a few scattered white scales; the costa, inner margin narrowly, and veins ochreous brown; the lines dark brown except on costa where they are reddish; the medial sinuous; the postmedial almost coalescing with medial at vein 2 and on inner margin; the outer line dentate lunular; the outer margin produced at veins 3 and 4; cilia ochreous brown, tipped with white between 3 and 4 and 5 and 7. Hind wings broadly fuscous brown on costal and outer margins; from base and vein 4 to inner margin a large yellowish space shaded with brown and crossed by reddish; finely dentate postmedial and outer lines, the latter outwardly shaded with yellowish white; the termen crenulate from vein 4 to anal angle. Fore wings below brownish; the inner margin luteous; the costa ochreous yellow irrorated with red, and with origin of lines red; terminal interspaces fuscous. Hind wings below fuscous brown with a few white irrorations; the lines reddish, outwardly whitish shaded on inner half; some reddish and yellow suffusions below cell and vein 4 to inner margin.

Expanse 28 mm.

*Hab.* Tunis.

*Zaphanta fraterna*, sp. n.

Body buff-brown, the scaling somewhat opalescent; a black spot on hind tibia close to tarsi. Wings buff-brown, thinly irrorated with black; the base broadly tinged with opalescent lilacine grey; the outer margins with a similar tinge, but less marked. Fore wings: the costal margin from before middle broadly tinged with pale yellow; a black spot above vein 8, and a smaller spot below it nearer termen. Hind wings: costal margin pale yellow; a yellowish antemedial and postmedial shade; a lilacine-grey shade along outer half of inner margin. Underneath ochreous yellow more heavily irrorated with black, forming antemedial spots, discal streaks, and outer spots, those on fore wings subterminal below vein 2 and between veins 4-8.

Expanse 21 mm.

*Hab.* Sixola, Esperanza.

Closely allied to *Z. infantilis*, Dyar.

Notodontidæ.

*Schizura manca*, sp. n.

♂. Palpi fuscous fringed with brown. Head and thorax light brown. Abdomen brownish grey. Fore wings brown

shaded with fuscous grey on costal half to beyond cell; traces of a basal and geminate antemedial line; a velvety dark brown fine streak on discocellular; a fine dark line, finely lunular, curved around end of cell, inwardly oblique to submedian, then slightly outbent; a brownish postmedial shade, somewhat lunular and chiefly visible below vein 4; fine dark brown streaks between 4 and 5, and 5 and 6 from cell to termen; marginal dark lines between the veins, the one between 2 and 3 outwardly edged by a white spot. Hind wings whitish; pale brown hairs along inner margin; the outer margin broadly fuscous.

Expanse 33 mm.

*Hab.* Sixola.

*Salluca ruptilinea*, sp. n.

♂. Palpi dark brown fringed with buff. Frons whitish buff, vertex dark brown. Collar and thorax mottled brown and buff, probably more greenish when fresh. Abdomen fuscous grey; a green dorsal tuft at base; the last segment dorsally green. Fore wings green; geminate basal, an antemedial, geminate medial, and postmedial brown spots on costa, and smaller similar spots in cell, the medial spots in cell larger and partly reaching median; below cell the spots are smaller, inbent and form indistinct lines; an irregular brown shade beyond cell, cut by veins and green irrorations; postmedial fine, brown, geminate, consisting of small spots between the veins, somewhat lunular; an irregular subterminal fine whitish line preceded by a broad dark brownish shade; dark marginal spots between the veins. Hind wings dull greyish brown.

Expanse 32 mm.

*Hab.* Tuis.

*Heterocampa antistes*, sp. n.

♂. Palpi black fringed with mottled brown and buff. Head and thorax mottled dark brown, buff, and green. Abdomen dark greyish brown above; a dorsal tuft at base, mottled brown, black, and green. Fore wings dull green shaded with lilacine brown at base of inner margin, and a fuscous streak along inner margin; antemedial line dark brown, fine, lunular and geminate, rather indistinct; an oblique fuscous shade across end of cell and below it to postmedial, which is very fine, lunular, geminate, black, very indistinct, marked by a white spot on inner margin, and followed by white points on veins; discocellular green with

a dark line; the space from end of cell to near termen, and from vein 8 to vein 3 lilacine brown, the veins tinged with green; faint darker brown subterminal spots, almost obsolescent; the termen narrowly green, with some black irrorations close to cilia and whitish points at ends of veins. Hind wings dull fuscous brown; white points at ends of veins.

Expanse 44 mm.

*Hab.* El Sitio.

Resembling *H. viridescens*, Wlk., and *H. mullinsi*, Schs.

*Heterocampa mystica*, sp. n.

♀. Palpi and head mottled brown and grey. Collar and thorax grey tinged with green. Abdomen grey heavily irrorated with brown except on last two segments, which have only a few irrorations; fine fuscous segmental lines. Fore wings greyish irrorated with brown; the base tinged with green and crossed by a subbasal whitish line, oblique from costa; antemedial line fine, fuscous, dentate; some black points at base below cell; cell shaded with lilacine brown; a pale buff spot at end of cell containing a reddish-brown line, below it a fuscous shade to tornus; a brownish-green shade beyond cell, oblique towards costa; postmedial line, black, partly geminate, and lunular below vein 4: a subterminal brown shade from veins 4-7, preceded by reddish-brown spots, and followed above 6 by a fuscous shade to apex; a terminal black line interrupted by veins; black spots on cilia at veins. Hind wings fuscous grey; a terminal black line with pale spots at veins; cilia whitish buff, with black points.

Expanse 39 mm.

*Hab.* Juan Vinas.

*Talmeca gnoma*, sp. n.

♂. Palpi fuscous grey fringed with white. Head and collar buff tinged with green. Thorax dull grey shaded with green. Abdomen fuscous brown above with pale segmental lines; a reddish dorsal tuft at base. Fore wings lilacine grey, with some darker irrorations; a green streak below cell to vein 2; a darker green streak along lower portion of cell, expanding at discocellular and filling space between 4 and 5 to termen; a similar broad green space terminally from just above vein 3 to inner margin; antemedial dark, geminate, outcurved and interrupted; postmedial geminate, black and much outbent along costa, then incurved and pale brown,



intersected by veins and partly lunular; subterminal geminate black points on veins separated by whitish points; terminal black points between veins. Hind wings fuscous tinged with brown; cilia white.

Expanse 32 mm.

*Hab.* Sixola.

Near *T. pulchra*, Schs.

*Meragisa albescens*, sp. n.

♀. Head and thorax whitish grey, mottled with pale brown hairs. Abdomen above ochreous buff shaded with grey, a reddish-brown shade at base, the two terminal segments white, thinly irrorated with dark scales; underneath ochreous buff. Fore and hind legs with long white hairs; hind legs ochreous buff; tarsi with black rings. Fore wings white, thinly dusted with light brown; basal line dentate, interrupted, brown and geminate on costa, otherwise black; antemedial line, geminate, black, outwardly oblique and wavy from costa, inset below cell, outcurved above submedian, outwardly oblique below it; a dark brown line on discocellular, a medial dark streak on costa; postmedial fine, light brown, deeply lunular, followed by a lunular geminate black line, somewhat inset between 4 and 6 and below 3; terminal black points close to veins, connected between veins by deeply curved black lines; cilia white. Hind wings whitish grey, shaded with ochreous on basal half; the veins, a medial line, and broad outer shade fuscous grey. Underneath ochreous buff, the outer half suffused with fuscous grey.

Expanse 53 mm.

*Hab.* Tuis, Juan Vinas.

*Meragisa proxima*, sp. n.

♀. Palpi black fringed with grey. Head and thorax grey mottled with brown. Abdomen above brown, shaded with ochreous at base, the terminal segments white irrorated with brown; underneath ochreous buff. Fore and hind legs with grey hairs. Fore wings whitish grey, irrorated with darker grey; basal line geminate, black, deeply outcurved on costa, incurved and outbent below cell; antemedial outwardly oblique, slightly inset below cell, fine, black, geminate filled in with pale ochreous; a white point in cell; a dark streak on discocellular edged with white; very faint traces of a postmedial line, but distinct and geminate on costa, followed by the usual geminate black lunular line, which is

filled in with pale ochreous and followed by a brownish shade, widest and most heavily marked towards costa; the terminal points and black line as in *M. albescens*, Schs. Hind wings fuscous brown; cilia whitish. Underneath fuscous brown; costal margins finely pale ochreous; a terminal dark line on fore wings above vein 3; base of hind wings pale shaded.

Expanse 50 mm.

*Hab.* Juan Vinas.

Closely allied to *M. marcata*, Dogn., but readily distinguished by the absence of yellow on hind wings above at base.

#### DUNAMA, gen. nov.

Palpi slightly upturned, with second joint long, smoothly scaled, third minute. Antennæ pectinated, the tips with cilia. Legs smooth. Fore wings narrow, vein 5 from below upper angle of cell; 6 from near middle of areole; 7, 8, 10, from end of areole. Hind wings proportionately broader, the costal margin straight; 8 diverging from 7 before middle; 3 and 4 from lower angle of cell; 6 and 7 from upper angle; vein 5 weak.

Type of genus, *Dunama angulinea*, Schs.

#### *Dunama angulinea*, sp. n.

♂. Palpi, head, and thorax dark brown; vertex outwardly shaded with buff. Abdomen above fuscous; underneath and legs buff, the latter partly streaked with dark brown. Fore wings greyish brown; a subbasal buff shade on costa, and an interrupted dark brown subbasal line; a triangular dark antemedial shade on costa, and a round dark brown spot below cell, followed from cell to vein 2 by a medial geminate dark brown line, faintly visible on costa and inner margin; this line followed by a whitish-buff shade, most distinct from cell to vein 2; a postmedial brown shade angled at vein 4, and followed on veins from 5 to submedian by geminate dark streaks separated by buff spots; a subterminal fuscous-grey shade, widest from vein 4 to inner margin; marginal black spots preceded by a pale buff shade, cut by the fuscous-grey veins; termen fuscous grey. Hind wings fuscous brown. Underneath dull fuscous grey.

Expanse 22 mm.

*Hab.* Guapiles.

*Rifargia culpata*, sp. n.

♂. Palpi reddish brown, with two buff streaks and similar fringe in front. Head mottled brown and buff. Collar light brown, with a transverse fuscous-brown streak. Thorax buff-brown, shaded with dark grey posteriorly; patagia pale buff, dorsally edged with dark brown. Abdomen reddish brown above and below, shaded with buff laterally; the last two segments dorsally grey. Fore wings dark grey, shaded with light grey towards apex: basal third buff-brown, streaked with dark reddish brown on costa, narrower below cell; a dark line limits this space from costa to median, below which it forms two curves, and is preceded by a parallel dark grey shade; a fine brown line forms a large reniform spot at end of cell; postmedial line outcurved beyond cell, finely lunular, geminate, dark grey, followed by another geminate dark wavy line, deeply outbent on costa, incurved below vein 3, and partly defined by fuscous-brown spots; a subterminal whitish dentate shade; a reddish-brown apical spot, partly edged by fuscous-brown lines; a fine fuscous-brown marginal line from below vein 4, inset below each vein. Hind wings reddish brown; a darker medial line followed by a buff shade; a broad subterminal darker brown shade; the termen and cilia buff.

Expanse, ♂ 69 mm.; ♀ 83 mm.

*Hab.* Sixola.

Closely allied to *R. lemoulti*, Schs., but larger and differing in details.

*Hemiceras avangareza*, sp. n.

♂. Palpi, head, and collar roseate buff. Thorax dark lilacine grey. Abdomen light brown; a lateral whitish streak. Fore wings dull brown tinged with fuscous, lines pale buff; antemedial forming three outward curves from subcostal, and a smaller curve on costa; the outer line from costa near apex to middle of inner margin; a dark line on discocellular preceded by a black point close to subcostal; costa finely buff. Hind wings white, the outer margin tinged with light brown.

Expanse 36 mm.

*Hab.* Avangarez.

Similar to *H. albulana*, Dr., from the same locality, except in colour.

## Sphingidæ.

*Hyloicus biolleyi*, sp. n.

♀. Palpi brown, fringed with white at base; frons slightly darker brown, vertex brown, shaded with black behind; collar dorsally black, outwardly edged by a brown-black line, which continues to tips of patagia, and is followed by a lateral brown and white shade; patagia otherwise and thorax reddish brown, mottled with a few whitish scales; abdomen at base dorsally tufted with light brown and with sublateral black spots followed by a broad whitish band, and subsequently by alternate broad black and narrow white bands; two dorsal brown and grey lines diverging and expanding towards anal segments; abdomen white underneath, with black ventral points. Fore wings brown, irrorated with whitish buff; a basal, geminate antemedial, medial and post-medial angled black spots on costa; black and white tufts at base of inner margin; an antemedial patch of roseate buff scales below cell, cut by a fine black line; a black streak in cell and beyond it, cutting a medial round fuscous spot and interrupted by a white point on discocellular; black streaks above veins 2, 3, and 5; an outcurved post-medial fuscous shade, followed by an indistinct fine, fuscous, dentate line; an outcurved series of subterminal angled black lines between the veins, nearest to termen between 2 and 4; an oblique black line to apex from vein 6, interrupted by vein 7; some small terminal black spots. Hind wings black; a whitish antemedial line inobscure towards base on costal and inner margins; a sinuous white postmedial band; cilia white, spotted with black.

Expanse 90 mm.

Hab. Tablazo.

Allied to *H. lugens*, Wlk., but very different in the details of its markings. Named after the late Prof. Biolley, to whom I am indebted for this specimen.

*Ambulyx goeldi marcata*, subsp. n.

♂. Differs from *A. goeldi* Roths., in having all the shadings and lines more distinctly marked; the postmedial and outer lines on fore wings fine, geminate, and well marked. Hind wings with a third line between medial and outer lines. Fore wings below: a fuscous-brown irregular and heavily marked postmedial line; the outer line fine and geminate. Hind wings with the third line as on upper side.

Expanse 98 mm.

Hab. Tuis.



## Megalopygidae.

*Megalopyge costaricensis*, sp. n.

Body dorsally whitish yellow, laterally on collar, thorax, and abdomen shaded with brownish buff; frons brownish; throat black. Fore wings brown, darkest at base, paler postmedially, fading into the broad whitish-yellow outer margin; black and whitish streaks on costa medially and in basal half of cell; postmedial small, triangular, whitish spots inwardly oblique from vein 5; a brown shade at veins 7 and 8. Hind wings whitish yellow, faintly darker shaded below cell.

Expanse 35 mm.

*Hab.* Tuis, Sixola, Juan Vinas.

Probably only a race of *M. ornata*, Druce, the wings being rather more pointed and brighter coloured.

*Megalopyge torva*, sp. n.

♂. Frons buff-brown, shaded with fuscous medially. Vertex white. Collar black-brown. Thorax brown, darkest medially, with two large transverse white spots in front. Abdomen banded black and whitish buff; two large dark brown dorsal tufts at base. Fore wings fuscous grey tinged with brown; a white patch at base between median and submedian containing a fuscous streak; a white streak in cell; postmedial space white, outwardly dentate between veins with whitish streaks on veins, and dark streaks between the veins, not reaching the angles; dark expanding shadings to the white streaks on veins, chiefly noticeable towards apex. Hind wings grey-brown, the veins darker.

Expanse 50 mm.

*Hab.* Juan Vinas, Tuis.

*Mesoscia dyari*, sp. n.

♂. Frons dark brown; vertex grey-brown. Collar yellowish white, shaded with black-brown in front. Thorax white, the patagia dorsally edged with fuscous brown. Abdomen fuscous brown above and ventrally, sublaterally whitish. Fore wings: the costal edge fuscous brown, below it for two-thirds a broad yellowish-white shade, extending at base to inner margin: medial space fuscous brown, extending to apex and outer margin below submedian, where it is met by a paler grey-brown terminal broad shade, which does not extend above vein 4; outer space otherwise yellowish white, its inner edge oblique from apex to vein 5, then incurved,

tapering to a point above submedian. Hind wings white; the costa broadly, also the inner margin, and the outer margin near anal angle more narrowly shaded with fuscous grey.

Expanse 29 mm.

*Hab.* Juan Vinas.

Near *M. eriophora*, Sepp.

*Trosia lena*, sp. n.

♂. Antennæ crimson. Body white; frons strongly shaded with crimson; eyes very black, narrowly surrounded by black hairs; fore femora and coxæ fuscous brown. Wings white.

Expanse 25 mm.

*Hab.* Juan Vinas, Cachi.

*Aidos admiranda*, sp. n.

♂. Palpi black, fringed with white. Frons black, with a central white spot. Vertex brownish. Collar white, black in front. Thorax whitish, shaded with ochreous and brown. Abdomen crimson; a large black dorsal tuft at base. Fore wings: the basal half whitish, tinged with ochreous brown on veins; a black costal streak; a fuscous-brown streak on submedian; traces of a curved brownish antemedial line; outer half fuscous brown; a black line inbent from costa to subcostal and outcurved around cell; postmedial black streaks on veins, followed by a faint greyish, wavy shade, and subterminal black streaks connected by a dentate line; the apex whitish grey. Hind wings crimson; the outer margin broadly black, narrowing at anal angle. Underneath: basal half of wings crimson, outer half fuscous grey, the veins darker.

Expanse 27 mm.

*Hab.* Sixola.

Allied to *A. perfusa*, Schs.

Cicinnidæ.

*Cicinnus lygia*, sp. n.

♂. Palpi and head pale brown. Collar, thorax, abdomen, and wings lilacine grey, the wings with scattered black irrorations. Fore wings excised from below apex to vein 3, inbent below it, slightly crenulate; a fine wavy darker antemedial shade; a faint reddish-brown shade at end of

cell, and oblique black line on discocellular; a fine dark postmedial line, slightly inbent; a faint darker space above tornus. Hind wings crenulate, the anal angle produced; a faint antemedial and postmedial dark line. Fore wings below shaded with dull reddish brown to postmedial line; the outer margin of hind wing similarly shaded.

Expanse, ♂ 34 mm.

Female: the hind wings with the outer margin well out-curved.

Expanse, ♀ 42 mm.

*Hab.* Sixola.

### Zygænidæ.

#### *Pseudotalara euthoracica*, sp. n.

♀. Black; the fore wings a little more lustrous purplish than the hind wings. Vertex of head and thorax orange-yellow, as are also the sides of the thorax in front and the fore coxæ.

Expanse 21 mm.

*Hab.* Sirio.

#### *Pseudotalara schedoxantha*, sp. n.

♀. Orange-yellow: eyes and antennæ black; legs black except the fore coxæ; abdomen with a broad dorsal black stripe, the venter slightly touched with black on the segments. Wings orange-yellow, the fore wings a little more opaquely coloured and shining than the hind wings; fore wing with the costa and fringe narrowly black above, the apex more broadly black below; hind wing with extreme outer margin and fringe black, the apex somewhat more broadly so; alike above and below.

Expanse 24 mm.

*Hab.* Mount Poas.

Allied to *Pseudotalara lateralis*, Dyar.

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### III.—*Observations on Coleoptera of the Family Buprestidæ, with Descriptions of new Species.* By CHAS. O. WATERHOUSE, I.S.O., F.E.S.

[Continued from vol. xv. 1905, p. 584.]

HAVING recently rearranged the Buprestidæ in the British Museum belonging to the genus *Ceoclyptus*, I noticed several species which appear to require names, and which I now describe.

Capitaine Kerremans in Wytsman's 'Genera' adopts the genus *Pithiscus* as distinct from *Conognatha* on account of the difference in the form of the prosternum. I think this separation cannot be maintained. I find every gradation from *C. hæmorrhoidalis* (the type of the genus) to *viridiventris* (the type of *Pithiscus*). The species are very diverse, but may be arranged in groups, which, however, cannot be defined even as sections. The following is the order in which the species are arranged in the Museum:—

*C. hæmorrhoidalis*, *pretiosissima*, *iris*, *magnifica*, *vargasi*, *juno*. (All these have the prosternum conically produced in front.)

*C. buqueti*, *amæna*, *princeps*, *impressipennis*, *splendens*, *batesii*, *minor*.

*C. leachi*, *ornata*.

*C. clara*, *abdominalis*, *eximia*, *interrupta*.

*C. rufiventris*, *bifasciata*, *trizonata*.

*C. badeni*, *octoguttata*, *excellens*.

*C. posticalis*, *apicalis*, *flavipennis*, *rojeri*, *nigropurpurea*. (These five species have the disk of the thorax impressed, and have a fovea above each posterior angle.)

*C. paranensis*.

*C. fascipennis*, *subdilatata*, *insignis*, *parallela*, *sellovii*, *nigrocærulea*, *miliaris*, *elongata*. (Thorax with posterior angles impressed.)

All the foregoing have the thorax delicately punctured.

*C. propinqua*, *klugi*. (Thorax moderately strongly punctured, forming a transition to the coarsely punctured species which follow.)

*C. auricollis*, C. & G.\*

*C. nero*, *principalis*.

*C. chilensis*, *gounellei*, *compta*, *consobrina*, *cyanicollis*, *errata*.

*C. macleayi*, *vulnerata*.

*C. olivacea*, *brevicollis*, *rufipes*.

*C. hamatifera*, *parallelogramma*.

*C. lebasi*, *souverbii*, *edwardsi*.

*C. costipennis*.

*C. viridiventris* (type of *Pithiscus*), *hastaria*, *sagittaria*.

I think *C. bruchi*, Kerrem., is undoubtedly the same

\* By some unaccountable error the male of *C. edwardsi* is frequently found in collections under this name. The true *auricollis* is a broad species with unicolorous elytra.



as *C. viridiventris*. Capt. Kerremans had probably not had access to the figure of the latter.

*C. edwardsi*. If I am right in the determination of the sexes of this species, all the males have a broad fascia and the apex of the elytra brown; the females have this colour confined to the suture and margins.

*Conognatha splendens*, sp. n.

Elongate, narrow, somewhat elliptical, brilliant golden green; the elytra with a rather broad yellow fascia at a short distance from the apex. Antennæ black. Clypeus deeply triangularly emarginate. Thorax convex, arcuately narrowed in front, rather finely and moderately closely punctured, very slightly sinuate before the acute posterior angles, which are more closely punctured and slightly impressed. Scutellum not very large, as long as broad, arcuately narrowed posteriorly. Elytra at the base of exactly the same width as the thorax, gradually and arcuately narrowed towards the apex; finely punctate-striate, the interstices only very slightly convex, but more strongly so at the apex. The apical margins have four or five obtuse, scarcely noticeable teeth. Prosternum convex, rather closely and moderately strongly punctured, the front part sloping down, transversely rugulose, and separated from the upper part by a slight but distinct carina. Tibiæ and tarsi dark steel-blue, the apical three segments of the abdomen narrowly edged with blue; the apical segment gently emarginate. ♂.

Long. 19 mm.

*Hab.* Parana.

*Conognatha leachi*, sp. n.

Brilliant metallic golden green, shining. Thorax much narrowed in front, gently arcuate at the sides, very delicately and not very closely punctured, with a strong impression at each posterior angle. Scutellum rather small, arcuately acuminate. Elytra exactly the same width as the base of the thorax, of a darker bluer green than the thorax, deeply punctate-striate, the interstices rather strongly convex except near the scutellum. Each has the following clear yellow ornamentation: a stripe extending from the base to a little beyond the middle, broad at the base, narrower posteriorly, not quite reaching the suture behind, then it turns in a flexuous band to the margin and runs along the marginal costa to the base (leaving a small green spot below the shoulder). Between this and the apex there is an angulated

fascia extending from the suture to the margin. At the apex a small lunate spot. At the margin there are six or seven acute teeth, with the usual acute apical spines. Prosternum horizontal, shining, moderately closely and distinctly punctured, very slightly produced at the apex, which is transversely rugulose.

Long. 17, lat. 7 mm.

Hab. N. Argentina (*Mrs. Leach*).

This very beautiful little species may be placed near *C. minor*, but its markings somewhat resemble those of *compta*.

*Conognatha ornata*, sp. n.

Closely resembles *C. leachi*, and at first I believed it to be the same, but it differs in the following points:—Thorax slightly but distinctly widened just before the posterior angles, the impressions deeper and much more strongly punctured than the rest of the surface. Prosternum not produced in front, but sloping down. The elytra are rather darker green, the markings brownish yellow, but very similar. The stripe is not narrowed behind and after turning to the margin it is not joined to the narrow yellow on the marginal costa, which appears only as a stripe below the shoulder. The apical spot is larger.

Long. 17, lat. 7 mm.

Hab. La Plata, Salta (ex coll. *Fry*).

*Conognatha abdominalis*, sp. n.

Elongate, parallel, deep steel-blue, the elytra with a purple tint, abdomen entirely dull reddish yellow. Clypeus and antennæ with a slight green shade. Thorax strongly convex, very finely punctured, obliquely narrowed in front, the sides nearly straight, not quite so broad as the elytra at the posterior angles, which are very acute, convex, without any impression. Scutellum elongate, slightly narrowed towards the apex, which is acute. Elytra parallel, a trifle wider just before the apex than in the middle, with numerous costæ, those near the suture strongest but not extending to the base: apex obtusely rounded, with numerous acute teeth, the sutural one and the one next to it more prominent than the others with an emargination between them. Prosternum very convex, finely but very distinctly punctured, obtuse in front and scarcely produced. Abdomen dull reddish yellow, with slight purple reflections, nearly straight at the apex. ♀.

Long. 24 mm.

*Hab.* British Guiana (A. W. Bartlett).

This species is somewhat intermediate between *C. clara* and *C. eximia*. From *clara* it differs in having a narrower thorax and less expanded apex to the elytra, which are also less strongly costate. From *eximia* it differs in having the thorax a little narrower, the scutellum is rather more narrowed posteriorly, and the elytra have no yellow band. From both it differs in having a yellow abdomen.

*Conognatha rufiventris*, sp. n.

Elongate, parallel, deep steel-blue, head and thorax almost black, with green reflections; elytra very dark purple, with two yellow bands, one before the middle, narrow at the suture, widened to the third interstice, then slightly arcuate and narrowed to the margin; the second band at one-quarter from the apex, rectilinear posteriorly, slightly flexuous anteriorly. Abdomen entirely reddish yellow with faint purple reflections. Antennæ very dark green. Thorax convex, obliquely narrowed in front, not quite so broad as the elytra at the shoulders, the angles very acute. Scutellum elongate, very slightly narrowed posteriorly, obtuse at the apex, where there is a slight impression. Elytra subparallel, only slightly narrowed towards the apex, finely punctate-striate, the second interstice slightly costiform posteriorly, the third with a fine raised line near the apex, the fourth convex for its whole length. Apex with about six strong acute teeth, commencing behind the yellow fascia, the sixth tooth more prominent than the others, with a somewhat wide space between it and the acute sutural tooth, the margin between these two teeth straight. Prosternum convex, obtuse but not conical in front. Abdomen reddish yellow, the apical segment slightly emarginate. ♂.

Long. 20 mm.

*Hab.* Brazil.

The specimen described was received with Capt. Kerremans' collection, from Chevrolat's collection, and was labelled "*bifasciata*, Waterh." It differs from that species in its dark colour, smaller size, longer scutellum, less costate elytra, totally different serration of the apex, and in the colour of the abdomen.

M. Théry has described (Bull. Soc. Ent. Fr. 1904, p. 75) a species (*C. mayeti*) closely allied to this. He says: "il se distingue de *C. bifasciata*, Wat., par sa taille plus grande et son abdomen de même couleur que le rest du corps."

*C. bifasciata*, however, has a blue abdomen of the same colour as the rest of the body. Nevertheless I think *C. mayeti* is distinct from *C. bifasciata* on account of the very narrow posterior fascia of the elytra.

*Conognatha apicalis*, sp. n.

Brassy black, shining; thorax strongly impressed on the disk, with a deep fovea above each posterior angle. Elytra yellow with black apical markings. The thorax is delicately and not closely punctured; much narrowed in front, somewhat abruptly enlarged at the middle, and then continuing to become wider to the posterior angles. The discal impression is very large and is continued to the front margin by a channel; the effect of this is to leave two slight but distinct tubercles in front of the middle. The scutellum is rather small, rounded posteriorly. The elytra are exactly the width of the base of the thorax, parallel for two-thirds their length, then narrowed to the apex. The striæ are rather finely punctured, moderately impressed (except near the scutellum), the interstices slightly convex. At a little distance from apex there is an irregular transverse oval black spot, and a small spot near the margin. Behind this there is a fascia which does not quite reach the margin, much narrowed at the suture, angulated in front. The apex is black, and is united to the fascia by the black suture. The apical margins are acutely dentate. The usual apical spines are strong, not very widely separated, the outer one the larger. Abdomen obscure red, with blue reflections. ♀.

Long. 19, lat. 7 mm.

Hab. Novo Friburgo, Brazil (*Bescke*).

The specimen described is from the same locality as *C. posticalis*, Saund., and was collected with it, and was believed to be that species until the Museum received the type from Fry's collection. It differs from that species in having the thorax very deeply impressed on the disk, the elytra have no humeral spot, the apical spots are slightly different (in *posticalis* the subapical fascia reaches the margin, but does not reach the suture and is not united with the black apex), the apical spines are larger, the striæ are more impressed, and, lastly, the abdomen is entirely red, whereas in *posticalis* only the apical three segments are yellow.

*Conognatha nigro-purpurea*, sp. n.

Dark purple, appearing almost black in some lights. Thorax very obliquely narrowed anteriorly, punctuation very



fine, disk with a well-marked circular impression occupying more than half the length of the thorax, posterior angles very acute, with a triangular impression above. Scutellum small, transverse, rounded behind. Elytra at the extreme base exactly the same width as the base of the thorax, but immediately widened at the shoulders, then gradually narrowed to the apex; very faintly and finely striate-punctate, appearing almost smooth; with a broad sinuous yellow fascia, which leaves only a small amount of the apex purple. The apex of each with the two usual acute strong teeth, which are not far apart, and between the outer one and the yellow fascia there are six acute teeth. Each elytron has, rather behind the middle and near the side, an elongate, shallow impression. Prosternum convex, very slightly swollen in front, scarcely sloping. Abdomen with the apical three segments reddish yellow.

Long. 18, lat.  $7\frac{1}{2}$  mm.

Hab. Brazil, Novo Friburgo.

This species may be placed near *C. rogeri*, Saunders, but it is not like any species known to me.

[To be continued.]

#### IV.—Some new Mammals from British East Africa.

By Dr. EINAR LÖNNBERG, F.M.Z.S. &c.

THE following new mammals collected in British East Africa will be more fully described in a paper, which will shortly be published, on the collections obtained in that country by the Swedish Zoological Expedition (1911). In the meantime the following preliminary diagnoses are given.

##### *Colobus abyssinicus kikuyuensis*, subsp. n.

Closely allied to *Colobus caudatus*, Thomas, but smaller, with the white tuft of the tail shorter and less developed, measuring only 44 cm. to the tips of the hair in a rather old male. The black of the basal part of the tail extending over 24–27 cm., thus longer than in *C. caudatus*. The young not white, as in *C. caudatus*, but nearly of the same colour as in the adult.

Condyllo-basal length of skull in a rather old male 101 mm. (111 mm. in *C. caudatus*); occipito-nasal length 91 mm. (101 mm. in *C. caudatus*).

Six specimens examined.

Type locality. E-carpment Station.

*Galago (Otolemur) kikuyuensis*, sp. n.

General colour pale greyish brown, somewhat darker on head and upper neck, outside of limbs more chamois; throat and lower side of neck with an ochre-yellow tinge; underside of body dirty white; hands and feet dark brown, inclining to blackish; tail dark brown, gradually darkening to blackish towards the distal third, paler below. Ears naked.

Total length about 62 cm.; tail about equal to head and body.

	mm.
Greatest length of skull .....	61
Basiscranial length of skull.....	49
Zygomatic breadth .....	41
Palatal length .....	23
Length of upper molar series.....	19·5

*Type locality.* Escarpment Station.

*Helogale hirtula ahlseelli*, subsp. n.

Body and tail all over coarsely grizzled with ochre-yellow and black, producing an olive-brown general coloration. Yellowish subterminal rings about 3 mm. Head very dark grey, produced by a fine white sprinkling on black. Lower parts grizzled like upper, but duller. Fingers and toes more or less black. Hair of back 12-14 mm.

Length of head and body 25-26 cm., of tail 18-20 cm., of hind foot with claws 54-56 mm.

	mm.
Condyllo-basal length of skull (♂) ..	52·5
Basiscranial .....	49
Zygomatic breadth .....	32-33·3
Interorbital breadth.....	12·1-12·9
Greatest diameter of $p^4$ .....	6·1-6·4
" " $m^2$ .....	4·5
Front of canine to back of $m^2$ ....	18·8

*Type locality.* Thorn-bush country on the northern side of Guaso Nyiri.

*Hyæna schillingsi rendilis*, subsp. n.

Nearly related to *H. schillingsi* of the Kilimanjaro district, but much paler in its ground-colour. Black longitudinal stripe on either side of the mane of the upper neck little conspicuous, more or less broken up in short streaks. Mane of the back whitish-looking, with the thin maroon tips not producing much effect. Tail very pale. Black stripes on

shoulders and flanks much narrower than in *H. schillingsi*. Three narrow stripes running from dorsal crest over hind-quarters (two broad ones in *H. schillingsi*). Stripes on flanks often broken up. Legs paler than in *H. schillingsi*.

Skull-measurements rather similar to those of *H. schillingsi*.

Two specimens examined, a young adult female and a male, both alike.

*Type locality.* Thorn-bush country north of Guaso Nyiri.

*Cephalophus harveyi kenia*, subsp. n.

Similar to *C. harveyi*, but coronal tuft not black, but mahogany-coloured in the middle, rufous on the sides. Fore legs and hind legs from above the hocks glossy brownish black. A brown mesial streak over the chest.

	mm.
Basiscranial length of skull (♀ ad.) . . . . .	151
Zygomatic width . . . . .	77
Distance from orbit to tip of premaxillary . .	88
Length of nasals . . . . .	58
"    upper molar series . . . . .	49

*Type locality.* Forests near Nairobi.

*Rhynchotragus cavendishi minor*, subsp. n.

A *Rhynchotragus* of the *Rh. kirki* group, with the premaxillaries forming a broad suture with the nasals as in *Rh. cavendishi*, Thomas, but much smaller than that species.

General colour above grizzled yellowish grey, which colour is produced by buffish-yellow subterminal rings and dark brown tips to the hair. Neck paler greyish (less yellowish), with whitish subterminal rings. Flanks less grizzled and paler than the back, about sand-coloured. Surroundings of tail and posterior parts of hams pure ashy grey. Lower parts suffused with buff only, the middle of the belly and inner side of hind legs being pure white. Legs and middle of face fulvous buff. Sides of face paler, almost sandy. White eye-mark well developed. Anterior shorter portion of crest ringed with buffish white and dark brown, but greater posterior portion dull fulvous buff, with hardly conspicuous dark tips to some of the hairs in the males (the females have a smaller crest very broadly tipped with black). Ears sand-coloured, with a black line along the margin on the upper half.

	mm.
Basiscranial length of skull (♂) . . . . .	92-94
Zygomatic width . . . . .	50-54
Length of nasals . . . . .	21-23
Posterior brim of orbit to gnathion . . . . .	76-77
Length of upper molar series . . . . .	34-35

*Type locality.* Thorn-bush north of Guaso Nyiri, below Chanler Falls.

*Potamochoerus chæropotamus keniaë*, subsp. n.

Head white, with black ears; a black patch round each eye and a black streak above the white whiskers. Dorsal crest from behind the ears to the middle of the back of black bristles with long white tips. In the sacral region in front of the tail similar bristles form a slight crest. Sides of back rich rufous much mixed with black; sides of body and neck, lower parts, legs, and feet black. Width of parietal flat area about 8.3 per cent. of upper mesial length of skull.

	mm.
Upper mesial length of skull (♂) .....	349
Width of parietal flat area .....	29
Greatest zygomatic width .....	177

Canine apophyses strongly developed and ankylosed with lateral exostoses of snout. Nasal surface flat and very broad.

*Type locality.* Forests near Nairobi.

*Procavia brucei borana*, subsp. n.

A member of the *Heterohyrax* group, which is closely related to *Procavia brucei hindei*, Wroughton, but much smaller.

General colour of back burnt umber-brown, grizzled with whitish, and dark brown tips to the hair. Face darker than back, almost pure blackish brown. Superciliary mark dull whitish, dorsal spot cinnamon (no. 4, Rép. de Coul.); flanks brownish grey. Underparts from chin to vent dull creamy white, a little buffish between fore legs and round vent.

Length of hind foot (skin-measurement) about 53 mm.

Skull of type specimen (♀, stage VIII.): greatest length 74 mm.; basilar length 66; zygomatic breadth 39.5; length of nasals 16; length of upper molar series 28.3.

Protuberances on the posterior margin of the palate just as described by Wroughton for *P. b. hindei*. As the type of the latter was also a female stage VIII., the measurements of the skulls are directly comparable.

*Type locality.* North of Guaso Nyiri, not far east of the Marsabit road.



*Sylvisorex sorelloides*, sp. n.

A long-tailed shrew, with four unicuspid, allied to *S. sorella*, Thomas, but differing from it by different proportions of the unicuspid and shape of last molar &c., as well as by colour, presence of lateral glands, &c.

Dark brown above, the colour being produced by the long brown tips of the hair, something between "raw umber" (Rép. de Coul. no. 301) and "brownish drab" (l. c. no. 302). Fur basally dark plumbeous. Lower side whitish, fur basally plumbeous grey. Hands and feet slender, hairy. Fingers and hands whitish, except the fifth and the lateral parts of the fourth, with the corresponding parts of the hands, which are brown. The two inner toes light. Tail long, slender, annulated, but covered with short hairs which do not conceal the annulation. No long bristles on the tail. Lateral muskglands strongly developed.

	mm.
Length of head and body .....	67
"    tail .....	84
"    hind foot, s. u. ....	15
Condylar-incisive length of skull .....	18.4
Greatest breadth of skull .....	about 8
Interorbital width .....	4.3
Maxillary series of teeth .....	8

First unicuspid large and sharply pointed. Second unicuspid not reaching half the height of the first and also a little smaller than the third, but much larger than the fourth. Last upper molar not "squarish."

*Type locality.* Acacia steppe, south of Guaso Nyiri.

V.—*Description of a new Species of the Genus Perionyx.*

By Dr. LUIGI COGNETTI DE MARTINI, R. Museo Zoologico, Torino.

THE earthworm described in the present paper was collected in Shoe Island, a small island near Auckland Island, by one of the officers of the steamship 'Discovery,' on her return from the Antarctic Expedition (1902). I have to express my sincere thanks to Prof. F. J. Bell, who sent me the worm for examination.

*Perionyx shoeanus*, sp. n.

A single specimen only.

*External characters*.—The body measures 165 mm. in length and 5–6 mm. in thickness; the number of segments is 205.

The colour is brownish.

The prostomium is pro-epilobus ( $\frac{1}{5}$ ).

The setæ are arranged in continuous rings as follows:—35/ii., 43/iii., 57/vi., 46/x.; dorsal and ventral gaps in the rings of setæ are not constant. The setæ are provided with some small semilunar excavations on the distal tract.

The clitellum is not yet developed.

The male pores are on xviii. segment, close to the ventral middle line.

A similar position is taken by the three pairs of spermathecal pores in the intersegmental furrows vi./vii., vii./viii., and viii./ix.

Female pores as nephridial and dorsal pores are not visible.

*Internal anatomy*.—The septa vi.–vii. to xv.–xvi. are moderately thickened.

An imperfectly developed gizzard lies in vi. segment. The portion of the œsophagus which occupies segments viii. to xv. is wider than elsewhere and is provided with many deep folds of epithelium. These folds are longitudinal and are provided with a blood-vessel. The intestine begins at the xvii. segment; a typhlosome is not recognizable.

Three pairs of moniliform hearts are found in segments x., xi., and xii.

The nephridia are meganephridia regularly disposed in two longitudinal series, close to the ventral nerve-chain.

A single pair of sparsely lobulated sperm-sacs lies in xii. segment.

A single pair of prostates is present. Each prostate is a tongue-shaped body, not divided into lobes, which projects from the side of the nerve-cord laterally into the xviii. segment. Penial setæ are wanting (perhaps in relation with the immature condition).

The three pairs of spermathecae lie in segments vii., viii., and ix. Each spermatheca consists of an oval main pouch with a very short duct; two small globular diverticula are placed on each side of the distal extremity of the duct.

*Loc.* Shoe Island, near Auckland Island.

The occurrence of a species of the genus *Perionyx* in a subantarctic island is a surprise. This genus was only

known from the Philippine and Sunda Islands, from the Indian Empire, Himalaya (11,900'), Ceylon, and Madagascar.

*P. shocanus* differs from its nearest ally, *P. saltans*, Bourne, particularly in the dimensions.

VI.—Additions to the Land-Molluscan Fauna of Rhodesia.

By H. B. PRESTON.

*Streptaxis gwandaensis*, sp. n. (Fig. 1.)

Shell perforate, roundly ovate, moderately solid, cream-coloured; whorls  $5\frac{1}{2}$ , the earlier whorls regularly increasing, flattish, the last two rapidly increasing and rounded, the last ascending in front, sculptured with indistinct, rather closely set, transverse, arcuate riblets which are more apparent in the subsutural region; suture impressed, regularly crenellate below by the terminations of the transverse riblets; base of shell rounded, almost smooth; umbilicus moderately narrow,



Fig. 1.—*Streptaxis gwandaensis*.



Fig. 2.—*Kaliella victoriae*.

deep, partly overhung by the outward expansion of the columella; columella outwardly broadened, descending obliquely in a gentle curve, diffused above into a rather thin well-defined callus, which reaches the upper margin of the labrum; labrum somewhat reflexed, receding above to form a shallow sinus; aperture edentulate, irregularly subquadrate;

Alt. 16; diam. maj. 12, diam. min. 11 mm.

Aperture: alt. 8, diam. 6 mm.

*Hab.* Near the Geelong Mine, Gwanda District, Rhodesia.

*Kaliella victoriæ*, sp. n. (Fig. 2.)

Shell small, turbinately conic, pale reddish brown; whorls  $5\frac{1}{2}$ ; regularly increasing, the last strongly carinate at the periphery, sculptured with closely set, rather fine, oblique, transverse plicæ and microscopic, somewhat indistinct, spiral striæ; base of shell closely spirally striate; suture impressed; columella obliquely descending, somewhat outwardly reflexed, spreading above into a light, well-defined, parietal callus which reaches the margin of the labrum; labrum simple, acute; aperture subrectangular.

Alt. 3; diam. maj. 3·5, diam. min. 3 mm.

Aperture: alt. 1, diam. 1·25 mm.

*Hab.* Victoria Falls (*M. Connolly*).

Distinguishable from *Helix* (*Trochonanina*) *pretoriensis*, Melv. & Ponsonby\*, chiefly by its less laterally compressed form and in having spiral striæ not only on the base but also on the whorls.

*Thapsiella connollyi*, sp. n. (Fig. 3.)

Shell small, perforate, depressedly turbinate, pale reddish brown, shining; whorls  $4\frac{1}{4}$ , rather convex, sculptured with very oblique, closely set, somewhat wavy, transverse plicæ; base of shell sculptured with closely set, fine, revolving, wavy



Fig. 3.—*Thapsiella connollyi*.



Fig. 4.—*Jaminia corrugata*.

striæ; suture well impressed; umbilicus very narrow, deep; columella slightly obliquely descending, outwardly expanded, diffused above into a light, whitish, ill-defined callus which does not reach right across the parietal wall; labrum simple; aperture obliquely sublunate.

Alt. 2; diam. maj. 3·25, diam. min. 3 mm.

Aperture: alt. 1, diam. 1·25 mm.

*Hab.* Rain Forest, Victoria Falls (*M. Connolly*).

\* Ann. & Mag. Nat. Hist. 1890, vi, p. 469; 1892, ix, pl. iv, fig. 5.



*Jaminia corrugata*, sp. n. (Fig. 4.)

Shell perforate, small, cylindrical, brownish bronze-colour; whorls 5, rather convex, the first three rapidly increasing in both length and breadth, the last two in length only, corrugated throughout, the third and fourth whorls being also obliquely, somewhat irregularly and distantly plicate; suture deeply impressed; umbilicus very narrow; columella whitish, outwardly and rather erectly expanded, obliquely descending; labrum also whitish, somewhat sinuous, dilated below, erect and angled above; aperture subquadrate, armed with a denticle just below the margin of the labrum, and below and to the left of this an oblique curved lamella on the parietal wall, a slightly projecting denticle very internally situate on the upper portion of the columella, and a small, rather indistinct, basal denticle situated well within and rather on the right-hand side of the shell.

Alt. 2.25, diam. maj. 1 mm.

Hab. Rain Forest, Victoria Falls (*M. Connolly*).



Fig. 5.—*Achatina connollyi*.

*Achatina connollyi*, sp. n. (Fig. 5.)

Shell allied to *Achatina semisculpta*, Pfr.\*, from Loanda, coast of Benguela, but differing from that species in its nearly smooth apical whorls, whereas in *A. semisculpta* the upper whorls are closely and conspicuously granulate; the sculpture on the later whorls in the present species is also considerably lighter than is the case with *A. semisculpta*.

\* Proc. Zool. Soc. London, 1845, p. 74.

Alt. 33·5 ; diam. maj. 16·25, diam. min. 14·75 mm.

Aperture : alt. 16, diam. 8 mm.

*Hab.* Victoria Falls, Rhodesia (*M. Connolly*).

The dimensions given above are those of the type specimen, which would seem to be an average example of the species ; but one specimen sent to me by the collector, and which I am unable to separate from the rest except on grounds of size, measures as follows :—Alt. 45 ; diam. maj. 21, diam. min. 19·5 mm. Aperture : alt. 20·5, diam. 9·5 mm.

VII.—*Some new Species of the Lamellicorn Genus Anomala from Sikkim, North India.* By GILBERT J. ARROW.

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MOST of the species here described were taken by R. P. Verschraegen at Kurseong and sent to me for determination by Baron Paul de Moffarts, to whom the British Museum is indebted for the types. Other specimens have been received from Mr. E. A. d'Abreu and the Museums of Paris, Berlin (Entom. Nat. Mus.) and Calcutta.

*Anomala flavofasciata*, sp. n.

Purpureo-nigra, antice cuprea, elytrorum fascia media transversa irregulari flava : ovalis, subnitida, supra dense punctata : clypeo punctato-rugoso, lato, antice fere recto, fronte ubique dense punctato ; pronoto crebre aequaliter punctato, paulo iridescenti, lateribus antice approximatis, angulis anticis acutis, posticis perpaulo obtusis, basi 3-sinuato, immarginato ; scutello bene punctato ; elytris sat profunde striatis, striis irregulariter punctatis, interstitiis inaequalibus, minute punctulatis ; pygidio haud subtiliter transverse strigato, apice parce piloso ; metasterno breviter fulvo-villoso ; tibiis bidentatis, pedum anticorum et intermediorum ungue majori fisso.

Long 14–16·5 mm. ; lat. max. 7·5–8·5 mm.

*Hab.* SIKKIM : Kurseong (4700–5000 ft.—*Annandale*), Gantok ; TONKIN : Mauson Mts. (2000–3000 ft.—*Fruhstorfer*).

Black or dark brown, with a greenish or bronzy lustre, which is scarcely traceable upon the posterior part of the elytra, and with a transverse zigzag yellow mark, interrupted or continuous, at the middle of the elytra. It is ovate in shape, moderately broad in the middle, and tapering in front

and behind. The head is densely punctured, rugosely upon the clypeus, which is broad. The pronotum is closely set with deep transverse punctures and has an iridescent lustre; its sides are subangulate before the middle, the front angles acute, the hind angles rectangular but slightly rounded off, the base not margined and moderately prominent in the middle. The scutellum is punctured like the pronotum. The elytra bear a flattened dilatation from the shoulder to beyond the middle; they are deeply striated, with confused punctures in the striae and upon the second and fourth interstices, which are broad, and fine scattered punctures upon the remaining surface. The pygidium is transversely strigose and bears a few erect tawny hairs. The metasternum is finely punctured and pubescent, and the abdomen irregularly striolated, with transverse rows of stout bristles. The mesosternum is not produced, the front tibiae are bidentate, and the larger claw of the front and middle feet is cleft.

♂. The front tibial teeth are short, the claw-joint is strongly curved and bears a short basal tooth and the lower lobe of the inner claw is broad.

*A. flavofasciata* is closely related to the Chinese *A. spiloptera*, Burm., as well as to *A. flavonotata* and *flaviventris*, which follow. The peculiar iridescent lustre of the pronotum, and the well-marked lateral flange of the elytra will serve to distinguish it.

This insect is nocturnal in its habits, Mr. Ammandale having noted that it hiles by day in the moss under tree-trunks and emerges at night.

### *Anomala flavonotata*, sp. n.

Viridi-nigra vel cupreo-nigra, levissime metallica, punctis elytrorum singulorum tribus, plerumque in fasciam transversam flavam conjunctis: longe ovata, nitida; capite crebre punctato, postice nitido; clypeo lato, rugoso, margine arcuato; pronoto et scutello minute sat crebre punctatis, illius lateribus antice approximatis, angulis anticis acutis, posticis fere rectis, basi trisinuato, immarginato; elytris parum profunde punctato-striatis, punctis postice obsoletis, interstitiis undique minutissime punctatis; pygidio levissime transversim strigato, apice parce piloso; metasterno rugoso, breviter villosa; abdominis lateribus striolatis; tibiis fortiter bidentatis, pedum anticum et intermediarum ungue majori fisso.

Long. 15-18 mm.; lat. max. 8-9 mm.

*Hab.* SIKKIM: Kurseong (*Verschraeghen*, *d'Abreu* — 5000 ft.); Darjeeling.

Very dark greenish- or coppery-black above and beneath,

with a narrow transverse zigzag yellow band at the middle of the elytra, sometimes breaking up into three small spots.

The body is elongate-oval, shining and moderately convex. The clypeus is short and rounded and rugosely punctured, the forehead closely and strongly punctured in front and thinly behind. The pronotum is rather finely and closely punctured, with the sides narrowed to the front, the front angles acute, the hind angles nearly right angles, the base trisinate and not margined. The scutellum is well punctured and the elytra rather unevenly punctate-striate, with a broad irregularly punctured subsutural space. The punctures disappear towards the apices, but the whole surface of the elytra is sprinkled with very fine scattered punctulations. The pygidium is very finely but not closely transversely strigose, with a few long hairs towards the apex. The metasternum is rugose and clothed with short erect pubescence and the abdomen is striolated at the sides. The front tibia is strongly bidentate and the larger claw of the front and middle feet is bifid.

♂. The upper surface is more minutely punctured and shining than in the ♀, the club of the antenna is longer, and the terminal tooth of the front tibia much shorter and sharper. The front claw-joint bears a sharp basal tooth.

♀. The terminal tooth of the front tibia is very broad and blunt.

*Anomala flaviventris*, sp. n.

Nigra vel purpureo-nigra, prothoracis lateribus haud late, elytrorum fascia media irregulari utrinque obliquata, pygidio (parte basali excepta), corpore subtus, antennis, femoribus, tibiisque 4 anterioribus, flavis; breviter cylindrica, sat parallela, corpore supra crebre punctato, haud nitido, subtus parce setoso; capite dense rugoso-punctato; clypeo brevi, subquadrato; prothorace crebre et minute punctato, lateribus medio subangulatis, angulis posticis fere rectis, basi immarginato; scutello punctato; elytris profunde striatis, striis confuse punctatis, interstitiis alternis convexis, minute punctatis, lateribus rugosis; pygidio transverse striolato, parce hirto; tibiis anticis apice fortiter bidentatis, pedum 4 anteriorum ungue majori fisso.

Long. 14.5 mm.; lat. max. 7.5 mm.

*Hab.* SIKKIM: Kurseong (*Verschraegen*, *Lynch*—5000 ft.); N. BENGAL: Siliguri (Calcutta Mus.—July 1907).

Black or purplish black, with yellow markings as follows:—Narrow lateral borders to the pronotum, an irregular transverse median band common to both elytra, directed slightly forward towards the extremities, which do not quite reach



the outer margins, the posterior part, or almost the whole, of the pygidium, the lower surface of the body, the antennæ, femora, and front and middle tibiæ.

The body is elongate, rather parallel-sided, closely punctured and scarcely shining above. The head is densely rugosely punctured, with the clypeus short and nearly straight in front. The pronotum is finely and densely punctured, with the sides obtusely angulate in the middle, the hind angles nearly right angles, the base not margined and very gently trisinnate. The scutellum is closely punctured at the sides. The elytra are deeply striated, with coarse confused punctures in the striæ and upon the alternate interstices, the remaining intervals being narrow, convex, and minutely punctured. The pygidium and lower surface are very thinly hairy and the metasternum is finely and closely punctured. The front tibia bears two strong teeth placed rather close together, and the front and middle feet have the larger claw bifid.

The antennal club is rather long in the male, and the tibial teeth are short and very sharp.

Three specimens taken by Verschraeghen at Kurseong are males and have the pygidium transversely striolated and broadly black at the base, while four specimens from the Calcutta Museum taken at Kurseong and Siliguri are all females, with the pygidium densely pitted and yellow, except for a very narrow black basal line.

### *Anomala flavopicta*, sp. n.

Pallide flava, capite, prothoracis vitta media, ad margines anticum et posticum attingente, scutelloque nigris, lævissime æneis, elytrorum fasciis duabus transversis irregularibus, pygidii margine basali, medio producto, tibiis extus vel toto tarsisque nigris vel fuscis, antennis longis et flavibus; corpore elongato sat angusto, parallelo, haud convexo, modice nitido; clypeo rugoso, angusto, omnino arcuato, fronte rugose, vertice parcius punctato; oculis magnis; pronoto crebre haud grosse punctato, lateribus ante medium angulatis, antice valde convergentibus, postice paulo divergentibus, angulis anticis acutis, posticis fere rectis, haud rotundatis, basi trisinuato; scutello crebre punctato; elytris biseriato-punctatis, fere costatis, intervallis latis, irregulariter punctatis, toto minutissime sat parce punctulatis; pygidio transverse striolato, apice longe ciliato; metasterni lateribus dense punctatis et fulvo-hirtis, mesosterno haud producto; tibiis anticis fortiter bidentatis, pedum 4 anteriorum ungue majori fisso.

Long. 13-14.5 mm.; lat. 7-7.5 mm.

*Hab.* SIKKIM: Kurseong (*E. A. d'Abreu*, *R. P. Verschraeghen*); Darjeeling (*Fruhstorfer*).

Pale yellow, with the head, a median stripe upon the pronotum extending from front to hind margin, narrowed before the latter but extending along it almost from side to side, the scutellum and two irregular transverse bands upon the elytra (the anterior one frequently reaching the base and sometimes uniting with the posterior band) black or dark brown, the head, thoracic markings, and scutellum faintly metallic. The base of the pygidium, with a pointed median prolongation, the tibiæ and tarsi are also dark, the front and middle tibiæ sometimes yellow on their inner side. The antennæ are long and yellow.

It is narrow, rather parallel-sided, and not convex. The clypeus is narrow, parabolic, and rugose. The eyes are large, the forehead very coarsely rugose, and the vertex strongly but not densely punctured. The pronotum and scutellum are closely punctured; the sides of the former are angulated before the middle, strongly convergent to the front angles, which are acute, and slightly divergent to the hind angles, which are nearly right angles. The elytra have three or four pairs of punctured striæ, bordering slight costæ which, like the remaining surface, are minutely and rather sparingly punctulated. The interstices are irregularly punctured. The pygidium is transversely striolated and bears long hairs at the apex. The metasternum is densely punctured and clothed with rather long yellow hair, except in the middle, and the abdomen is strongly but not closely punctured. There is no sternal process. The front tibiæ are strongly bidentate, and the longer claw of the front and middle feet is cleft.

♂. The inner front claw is broad and its lower edge strongly bisinuated.

This species is related to the Chinese *A. rufopartita*, Fairm., but is longer and narrower, and the markings are paler and less sharply defined.

*Anomala anthracina*, sp. n.

Nigra, nitida, capite pronotoque levissime arcuatis, abdomine subtus pygidioque utrinque rufo-spilotis, antennis rufis, capite, pectore pygidioque apice fulvo-pubescentibus; corpore convexo, parum elongato, postice lato; capite toto crebre rugoso, opaco; clypei margine antico levissime arcuato, reflexo; prothorace omnino marginato, subtiliter punctato, lateribus crebre punctatis, arcuatis, angulis posticis bene marcatis, baseos medio sat lobato, scutello vix punctato, lateribus marginatis; elytris intus profunde sat æqualiter sulcatis, extus minus fortiter punctato-striatis; pygidio minute et crebre rugoso-punctato; pectore longe et dense fulvo-

hirsuto, abdomine fere nudo; mesosterno haud producto; tibiis anticis bidentatis, pedum 4 anticorum ungue majori fisso.

♂, corpore breviori, pedum anticum tibia magis acute dentata, tarso incrassato, ungue majori lato, pedum posticum calcare longiori apice clavato.

Black, with a very feeble metallic lustre above, especially visible upon the head and pronotum; the mouth and antennae dull red, and the sides of the pygidium and abdominal segments exhibiting spots of the same colour, those of the pygidium generally uniting to form a wavy line.

The sternum is thickly clothed with long tawny hair, and the vertex of the head and apex of the pygidium bear a few similar hairs.

The body is stout and convex, not long, widest near the extremity. The head is densely rugose and opaque, and the clypeus transverse and very gently curved at the front margin. The pronotum is minutely punctured, rather densely at the sides but more scantily on the disc; it is entirely margined, the sides are rounded, the hind angles well marked, and the base rather prominent in the middle. The scutellum is scarcely punctured, but generally bears an impressed line on each side. The elytra are deeply and rather evenly sulcate internally, less deeply and more irregularly punctate-striate externally. The pygidium is finely and densely punctate-rugose. The mesosternum is not produced, the front tibia is bidentate, and the larger claw of the front and middle tarsi is cleft.

The male has the body shorter, the front tibial teeth sharper, the front tarsi thickened, and the larger claw very broad. The longer spur of the hind tibia is slender and clubbed at the end.

Length 14-16 mm.; lat. max. 8-9.5 mm.

*Hab.* SIKKIM: Kurseong (6000 ft.—*E. A. d'Abreu*, *R. P. Verschraegen*); Mungphu (*Atkinson*); Darjeeling (*Harmand*).

### *Anomala propinqua*, sp. n.

Cupreo-castanea, elytris paulo pallidioribus, pygidio abdomineque subtus utrinque flavido-spilotis, capite, pectore pygidique apice fulvo-pubescentibus; corpore modice elongato, convexo, postice lato; capite crebre rugoso, opaco; clypeo antico leviter arcuato, reflexo; prothorace omnino marginato, subtiliter punctato, lateribus crebre punctatis, medio angulatis, angulis posticis acutis, baseos medio sat lobato; scutello irregulariter punctato, utrinque breviter inciso; elytris profunde geminato-striatis; costis 4 elevatis formantibus, intervallis irregulariter grosse

punctatis; pygidio minute, lateribus crebre et rugose punctatis; pectore longe et dense fulvo-hirto, abdomine fere nudo, mesosterno haud producto; tibiis anticis bidentatis, pedum 4 anticorum ungue majori fisso.

♂, pedum anticorum tibiis magis acute dentatis, tarsis crassatis ungue majori valde dilatato et dextro; pedum posticum calcare longiori apice clavato.

Long. 16-18 mm.; lat. max. 9-9.5 mm.

*Hab.* ASSAM: Silhet, Cahar; SIKKIM: Darjeeling.

Coppery, with the elytra chestnut, slightly metallic, the sides of the pygidium and of the abdominal segments having more or less distinct paler spots, those on the pygidium generally uniting to form a wavy line. The sternum is thickly clothed with long tawny hairs, and there are a few similar hairs on the vertex of the head and the apex of the pygidium.

The body is slightly elongate, broadest near the extremity, and convex. The head is densely rugose and opaque, and the clypeus transverse with the front margin gently rounded. The pronotum is completely margined and minutely punctured, the punctures being fairly close in the middle and rather dense at the sides. The lateral margins are obtusely angulated in the middle, the hind angles are sharp, and the base is trisinuate. The scutellum is finely punctured and has a short linear impression on each side. Each elytron has a deep sutural stria and four paired striæ enclosing elevated costæ, and the intervening spaces are flat and strongly and irregularly punctured. The pygidium is finely, and at the sides densely and rugosely, punctured. The mesosternum is not produced, the front tibia is bidentate, and the larger claw of the front and middle feet is cleft.

The male is rather less elongate than the female, the front tibial teeth are sharper, the front tarsus thickened and its larger claw broad and abruptly bent. The longer spur of the hind tibia is slender and clubbed at the end.

This species, although different in colour and in the sculpture of the elytra, has evidently a peculiarly close relationship to *A. anthracina*, the pale marks upon the pygidium and the curiously-shaped spur of the hind tibia of the males being identical in the two.

### *Anomala marginipennis*, sp. n.

Pallide testacea, fronte, elytrorum marginibus extremis humerisque nigris, nonnunquam viridi-ænescentibus, tarsis rufis: elongata, parallela, depressa: capite fortiter et crebre punctato, clypeo



brevissimo, oculis magnis; pronoto crebre punctato, toto marginato, angulis anticis acutis, posticis obsoletis; scutello punctato; elytris profunde punctato-striatis, stria secunda antice disrupta; pygidio fortiter et crebre punctato, metasterno subtiliter punctato, breviter pubescenti; pedis antice tibia bidentata, ungue majori fisso.

Long. 14-16 mm.; lat. max. 7-8 mm.

*Hab.* ASSAM: Khasi Hills (3000-5000 ft.); Jorhat (*Deseme*); Parkai Mts. (*Doherty*); NEPAL; SIKKIM: Mungphu (*Atkinson*); BENGAL (*Simson*): Buxar Duars (*D. Nowrojee*).

Pale testaceous, with the head between the eyes, a narrow marginal line entirely encircling each elytron and a humeral spot black with a metallic-green lustre in certain lights, and the tarsi red.

The form is moderately long, rather depressed and parallel-sided. The head is entirely, closely and strongly punctured, with the clypeus very short and the eyes large and prominent. The pronotum is everywhere closely punctured, completely margined, with the front angles sharp, the hind angles rounded away and the base trisinuate. The scutellum is irregularly punctured and the elytra are deeply punctate-striate, the second stria breaking up in the anterior half. The pygidium is strongly and rather closely punctured, the metasternum finely punctured and thinly pubescent. The front tibia is bidentate and the inner front claw cleft. The club of the antenna is rather long.

♀. The eyes are smaller and the terminal tooth of the front tibia long and blunt.

This has the closest resemblance to *A. pallida*, F. (Java), and still more to *A. communis*, Burm., but may be readily distinguished by the entire absence of a third tooth to the front tibia. This is also present in *A. brachypus*, Bates, the only other N. Indian species. Another closely related species, *A. testacea*, Bl., has bidentate front tibiae, but is a more convex and cylindrical insect, with an almost smooth clypeus.

### *Anomala angusta*, sp. n.

Testacea, leviter cupreo-vel aureo-tincta, prothorace utrinque vago fusco-plagiato: elongata, angusta, parum convexa, corpore postice leviter amplescenti, pedibus gracilibus; capite grosse rugoso-punctato, clypeo semicirculari, sutura fere recta; prothorace crebre fere rude punctato, medio leviter canaliculato, lateribus haud arcuatis, ante medium angulatis, antice valde, postice haud contractis, angulis anticis acutis, posticis roctis, haud rotundatis, basi toto

marginato, levissime trisinuato; scutello crebre punctato, vix angulato; clytris fortiter sat aequaliter striatis, striis indistincte punctatis, interstitiis convexis, parce punctulatis; pygidio metasternique lateribus rugosis, griseo-hirtis; abdomine grosse punctato, sat parce hirtio; tibiis anticis bidentatis, pedum 4 anticorum ungue majori apice fisso.

Long. 10-12.5 mm.; lat. 5-7 mm.

*Hab.* SIKKIM: Mungphu (*Atkinson*); Kurseong (*Verschraegen*); Darjeeling (7000 ft.—*Brunetti*).

Testaceous, with a slight golden or coppery suffusion, and with a rather vague dark patch on each side of the pronotum.

It is a long narrow insect, slightly increasing in width from front to back, and not very convex. The head is rugosely punctured, and the clypeus is semicircular. The pronotum is strongly and closely punctured, lightly sulcate along the middle, strongly contracted in front, and broadest at the base. The sides are angulated before the middle, and nearly straight from there to the angles, which are sharp, the front angles acute and the hind right angles. The base is completely margined. The scutellum is closely punctured and rather rounded at the apex, and the elytra are deeply and rather evenly striated, the striae rather indistinctly punctured, the interstices convex and very sparsely punctured. The pygidium and the sides of the metasternum are rugose and clothed with grey hair, and the abdomen is coarsely punctured and more scantily hairy. The legs are long and slender, the front tibia bidentate, and the longer claw of the front and middle feet cleft at the apex, the latter very minutely.

♂. The inner front claw forms an extremely broad lamina.

♀. The inner front claw is rather broad.

This species is related to *A. straminea*, Sem., but is much more elongate and slightly metallic.

### *Anomala protea*, sp. n.

Rufo-testacea, capite, thorace pedibusque levissime metallicis, elytrorum puncta juxta-scutellari, marginibus lateralibus et apicalibus fasciaque transversa post-mediana nigris; vel elytris totis nigris, margine exiguo externo excepto; vel vertice, pronoto (lateribus exceptis), scutello, sterno, pedibusque viridi-nigris, elytris nigro-maculatis; vel tota testacea, elytris rufo-maculatis: breviter ovata, convexa, capite crebre et profundo punctato, clypei margine antico fere recto; pronoto sat fortiter punctato, medio paulo subtilius, lateribus fortiter rotundatis, angulis anticis acutis, posticis obtusis, basi levissime trisinuato, immarginato; scutello crebre punctato; elytris profunde striatis, striis grosse

punctatis, interstitiis angustis, 5°, 7° et 9° medio lineato-punctatis; pygidio corporisque subtus lateribus grosse et confluentius punctatis, his parce setosis; pedibus robustis, tibiis anticis valde 3-dentatis, pedum 4 anticorum ungue majori fisso. Long. 8-9 mm.; lat. max. 5-5.5 mm.

*Hab.* SIKKIM: Kurseong (*Verschraegen*); Mungphu (*Atkinson*); ASSAM: Sibsagar (*S. E. Peal*).

Reddish-testaceous, with a slight metallic lustre upon head, thorax, and legs; the elytra non-metallic and decorated with black markings, consisting of a large spot adjoining the scutellum on each side, broad lateral and apical margins and an irregular transverse band beyond the middle joining the lateral borders, the suture being reddish: or

the colour may be entirely pale, with reddish markings as described upon the elytra: or

the elytra may be entirely black, with very narrow anterior and external margins reddish-testaceous like the remainder of the body: or

the forehead, prothorax (except narrow lateral margins), scutellum, and legs may be metallic greenish black, the elytra with black bands as described.

It is a small, globose, shortly ovate insect. The head is coarsely and closely punctured, with the clypeus broad and nearly straight in front. The pronotum is strongly punctured at the sides, a little more finely in the middle, with the lateral margins strongly rounded, the front angles sharp, the hind angles obtuse, and the base very gently trisinuate and not margined. The scutellum is strongly punctured, and the elytra are deeply punctate-striate, the punctures large and annular, the interstices narrow, and the fifth, seventh, and ninth divided by longitudinal rows of punctures. The pygidium and the sides of the body beneath are coarsely and confluent punctured, the latter scantily hairy. There is no sternal process. The legs are stout, the front tibia strongly tridentate, and the larger claw of the front and middle feet is deeply cleft.

♂. The inner front claw is very broad.

This species is similar in shape and pattern to *A. decorata*, Kirsch, but it is a little smaller; the pronotum is much less densely punctured and the colour is not the same. The markings are remarkably inconstant. I have seen six specimens, most, if not all, males, but two specimens decorated with red instead of black may be females, being so fragmentary as to render the sex indeterminable.

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*Anomala pusilla*, sp. n.

Aureo- vel viridi-testacea, capite, macula prothoracis elongata extus utrinque angulata (nonnunquam obsolescenti) saturate viridibus, antennis nigris: ovata, parum convexa, nitida, antice et postice valde angustata: capite fortissime rugoso-punctato, clypeo parvo, rotundato, sutura fere obsoleta, vertice profunde punctato; prothoracis lateribus fortiter sed parcissime, medio vix, punctato, marginibus lateralibus medio valde angulatis, vix arcuatis, angulis anticis et posticis acutis, basi medio late rotundato, immarginato; scutello fere lævi, acute angulato; elytris sat profunde striato-punctatis; pygidio grosse rugoso, apice longe fulvo-hirto; metasterni lateribus rugosis, parce fulvo-hirtis; mesosterno paulo producto, compresso, elevato; tibiis fortiter bidentatis, pedum 4 anticorum ungue majori fisso:

♂, tibiis tarsisque obscure viridibus:

♀, tibiis tarsisque cupreis.

Long. 7-9 mm.; lat. 3.5-5 mm.

*Hab.* SIEKIM: Mungphu (Atkinson); Kurseong (Verschraagen); Shamdang; ASSAM: Manipur (Doherty); Shilong; NEPAL: Soondrigal.

Pale yellow, with a golden or golden-green suffusion, the head and a longitudinal patch on each side of the pronotum (angulated externally and not attaining the front or hind margin) dark green.

It is ovate, much narrowed in front and behind and not very convex. The head is very deeply and rugosely punctured, the clypeus small and rounded, and the suture almost obliterated. The pronotum is coarsely but sparsely punctured at the sides and almost smooth in the middle; the sides are strongly angulated in the middle and nearly straight from there to the front and hind angles, which are sharp; the base is broadly rounded in the middle and not margined. The scutellum is smooth and sharply pointed. The elytra are coarsely and deeply striate-punctate. The pygidium is coarsely rugose and bears a few long hairs near the apex. The metasternum is rugose and thinly pubescent, and the abdomen is coarsely punctured. The mesosternum forms a broad, compressed, slightly prominent lamina. The front tibiæ are strongly bidentate, and the larger claw of the front and middle feet is cleft.

The male is smaller, its elytra less broad, the prothorax less contracted anteriorly; the tibiæ and tarsi are dark green, the apical tooth of the front tibia is acute, the upper tooth slight, and the inner front claw broad.

♀. The shape is more oval, the elytra have the outer margins dilated and thickened from the shoulder to the



middle, the tibiae and tarsi are copper-coloured, and the apical tooth of the front tibia is rather blunt.

This is one of the small species having evident relationship to *Popillia* but differing in the absence of emargination to the pronotum in front of the scutellum.

*Anomala (Callistethus) tumidicauda*, sp. n.

Late rufa-aurantiaca, corpore subtus pedibusque viridi-aneis, capite et prothorace supra igneo-micantibus, hujus lateribus angusto purpureo-maculatis pygidioque leviter viridi-suffuso: oblonga, polita, modice convexa, corpore subtus griseo-hirto: capite, pronoto scutelloque politissimis, subtilissime punctulatis; clypeo lato, antrorsum leviter contracto, margine antico fere recto, modice reflexo; pronoto sat lato, antico contracto, lateribus vix arcuatis, ante medium angulatis, angulis anticis acutissimis, posticis fere rectis, basi immarginato, medio late lobato; elytris minute punctatis, punctis nonnullis biseriatis, lateribus vix explanatis; pygidio laevissimo, apice conico, parcissime hirto; processu mesosternali gracili, acuto, curvato, metasterno lateraliter dense punctato, medio laevi; tibiis anticis bidentatis, pedum 4 anticorum ungue majori fisso.

Long. 14-16.5 mm.; lat. max. 7-8.5 mm.

*Hab.* SIKKIM: Darjeeling (*Fruhstorfer, Harmand*); Kurseong (6000 ft.—*d'Abreu*).

Reddish orange, with the legs and lower surface metallic green, the head, prothorax, and scutellum suffused with crimson or golden red, and the pygidium with a pale greenish lustre, and the lateral margins of the prothorax having a narrow patch of a deep violet colour.

The body is oblong, very smooth and shining, and moderately convex. The head, pronotum, and scutellum are extremely smooth, with scarcely perceptible punctures; the clypeus is broad, narrowed slightly to the front margin, which is nearly straight and gently reflexed, and the clypeal suture is well marked and nearly straight. The pronotum is broad at the base and strongly narrowed to the front, with the sides scarcely curved, but feebly angulated before the middle, the front angles very acute, the hind angles almost right angles, the base rather prominent in the middle and not margined. The elytra are smooth and very minutely punctured, some of the punctures forming double rows upon the outer part. The outer margins are slightly flattened behind the shoulders for less than one-third of their length. The pygidium is extremely smooth and glossy and conically protuberant before the extremity, and there are a very few erect hairs in its hinder part. The mesosternal process is

slender, strongly curved, and acute. The metasternum is closely punctured and shortly pubescent at the sides and smooth in the middle, and the abdomen is smooth, with scanty pubescence at the sides. The front tibia is bidentate, and the longer claw of the front and middle feet cleft. The antennal club is long in both sexes.

♂. The terminal tooth of the tibia is short and sharp.

♀. The terminal tooth of the tibia is long and blunt.

The following species of *Anomala* also occur in Sikkim :—

*A. erythroptera*, Kr.

*A. (Adoretosoma) elegans*, Bl.

*A. (Callistethus) auronitens*, Hope.

*A. (Callistethus) pterygophorus*, Ol.

### VIII.—On small Mammals from the Lower Amazon.

By OLDFIELD THOMAS.

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I OWE again to the kindness of the authorities of the Goethe Museum, Para, the opportunity of examining a number of small mammals from the Lower Amazon recently added to that Museum.

Apart from a few odd specimens from localities near Para, the series consists of two collections—the one made by the Director of the Museum, Fräulein Dr. E. Sneathlage, at Boim, near the mouth of the Tapajoz; and the other formed by one of her pupils, Mr. Oscar Martins, at Faro, on the north side of the Amazon, near the mouth of the River Yamundá, some 200 kilometres N.W. of Boim.

The whole set prove to be of great interest, and show that further mammal collecting in this region is likely to result in valuable discoveries. Not only are there two very striking new species, the marmoset from Faro and the *Peromys* from Boim, but that most interesting group the *Loncherina* is represented by a number of little-known species, of which the most notable is *Isothrix pagurus*, now again obtained for the first time since its discovery seventy years ago.

The following is a list of all the specimens sent.

*Alouatta seniculus*, L.

One specimen.

*Callithrix argentata*, L.

♂. 1, 2. Mararu, Rio Tapajoz, near Santarem.

*Callithrix santarensis*, Matsch.

♂. 14. Boim, Rio Tapajoz (*Fräulein E. Snethlage*).

*Leontocebus martinsi*, sp. n.

♂. 1, 2 (young), 3, 31 (young); ♀. 5. Faro, Lower Yamundá River (*Oscar Martins*).

Precisely like *L. bicolor*, except that the head and fore limbs are of normal coloration, corresponding to the rest of the animal, not sharply contrasted white.

Head (in adult) naked from crown to chin, the skin black. Scanty hairs of back of crown and the nape black or brownish black. General colour of back and sides isabella, darkened along the dorsal area, the middle posterior back almost blackish. Under surface tawny ochraceous, duller anteriorly, richer posteriorly. Ears quite naked, black. Arms proximally isabella, buffy yellowish on forearms, hands cream-buff or rather more yellowish; whole inner side of arms ochraceous. Hind limbs externally isabella, becoming suffused with tawny towards ankles; inner aspect rich ochraceous, tending towards ochraceous rufous. Feet yellowish buffy. Tail black above nearly to the tip; underside and end sharply defined ochraceous.

Young specimens with the crown well-haired, blackish mixed with greyish; face and chin thinly haired, greyish; ears with black hairs about half an inch in length.

Skull and teeth essentially as in *L. bicolor*.

Dimensions of the type (measured in the flesh):—

Head and body 208 mm.; tail 366; hind foot 61; ear 31.

Skull: occiput to gnathion 51; basion to gnathion 36; zygomatic breadth 35.5; breadth across orbits 28.8; breadth of brain-case 27.5; length of upper cheek-tooth-series 10.

*Type.* Adult male. B.M. no. 11. 12. 22. 2. Original number 3. Collected 27th April, 1911.

This beautiful and interesting new marmoset, which I have much pleasure in naming after its discoverer, is an exact replica of *L. bicolor* in its naked head and in its coloration posterior to the head and fore limbs. But instead of having these, as in *L. bicolor*, conspicuously contrasted pure white, they are coloured quite normally in correspondence with the rest of the animal. It might therefore have been presumed that the present was a more ancestral form, from

which *L. bicolor* had been evolved by the accidental occurrence and then gradual predominance of semi-albinistic individuals of this normally coloured species. But the fact that the very young specimen of *L. martinsi* has its face and the sides of its crown clothed with silvery-grey hairs tells against this theory and in favour of the ancestors of both species having had heads of a grey colour.

The rule that "*Natura non facit saltum*," which I believe to be generally true of mammal coloration, has therefore not got an exception in this marmoset, as I at first believed to be the case.

*Dasypterus ega*, Gerv.

♀ . 30. Faro.

*Myotis nigricans*, Wied.

♀ . 28. Benevides, E.F.B., near Para.

*Saccopteryx bilineata*, Temm.

♂ . 22. Parana de Faro.

*Saccopteryx leptura*, Schr.

♀ . 4. Benevides, E.F.B., near Para.

*Rhynchiscus naso*, Wied.

♂ . 26, 29; ♀ . 27, 28. Faro.

♂ . 4. Apehu, E.F.B.

*Noctilio albiventer*, Spix.

♀ . 7. Faro.

*Molossus obscurus*, Geoff.

♂ . 9; ♀ . 13. Faro.

*Eumops trumbulli*, Thos.

♂ . 32. Faro.

Specimens from Ega in the collection of Mr. Tomes, determined by him as *E. perotis*, also prove to belong to this smaller Amazonian species. Examples of the three large-toothed *E. perotis* are in the Museum collection from Lagoa Santa and Cordova; its type locality was the Parahyba River, Rio Janeiro.



*Hemiderma perspicillatum*, L.

♂. 8; ♀. 9. Boim, R. Tapajoz (*E. Sneathlage*).  
 ♂. 1, 3; ♀. 2. Apehu, near Para.

*Glossophaga soricina*, Pall.

♂. 37; ♀. 10, 11, 12, 14, 35, 36, 37, 38, 39. Faro.  
 "In an old house."

*Artibeus cinereus*, Gerv.

♂. 2, 3; ♀. 1. Benevides, E.F.B., near Para.  
 ♀. 33. Faro.

*Sciurus aestuans gilvularis*, Wagn.

♀. 25. Faro (*O. Martins*).  
 Nearly topotypical, *S. gilvularis* having been described from Borba. Four pairs of mammae.

*Nectomys squamipes*, Bts.

♂. 14. Benevides, near Para.

*Ecomys tapajinus*, Thos.

♂. 2; ♀. 1. Marajo.  
 Somewhat intermediate between *E. tapajinus* and *E. guianæ*.

*Dactylomys dactylinus canescens*, subsp. n.

Essential characters as in true *dactylinus*, but colour greyer and less buffy. Flanks especially clear greyish, without any of the buffy so strongly marked in the type form. Rusty colour of underfur strongly marked along the middle dorsal area. Back of hind legs rich ochraceous. Under surface white.

Dimensions of the type (measured in skin):—

Head and body (c.) 300 mm.; tail 420; hind foot 58.

Skull: condylo-basal length 73; condylo-incisive length 70; zygomatic breadth 38.5; upper tooth-series 21.5.

*Hab.* Itacoatiara, below Manaus, Middle Amazons.

*Type.* Adult. B.M. no. 11. 12. 22. 15. Collected October, 1911, by Mr. W. M. Mann.

It has not been by any means easy to settle what should be taken as the type form of *Dactylomys*, for the original

specimen of *Echimy's dactylinus*, Desm., was without locality, and the several descriptions of different dates do not entirely agree with each other—probably owing to the progressive deterioration and bleaching of the type specimen.

Taking for this reason the earliest account as the most valid, we have the two by Desmarest\* in 1817 and 1822, in which it is clearly stated that the animal was “jaunâtre sur le dos” and “presque roux † sur les flancs,” the latter being the most characteristic mark of the Rio Napo specimens in the British Museum as compared with the skin from Itacoatiara. I therefore propose to consider the Upper Amazon animal as true *dactylinus*, and that from the river lower down as a new form.

This would also fall in with Dr. Jentink's identification of his specimens from Nauta (near the Rio Napo) as *D. dactylinus*.

*Loncheres grandis*, Wagn.

♂. 21; ♀. 24. Parana de Faro (*Oscar Martins*).

*Loncheres armatus*, Geoff.

♂. 20. Parana de Faro (*O. Martins*).

*Isothrix pagurus*, Wagn.

♂. 3. Boim, Rio Tapajoz (*E. Snethlage*).

As has happened with several members of the present family, this species was described from a specimen which had lost its tail, and as it has never been rediscovered until now, the present is the first perfect specimen ever recorded. The tail is longer than the head and body, uniformly clothed beyond the basal inch with soft hairs 7–8 mm. in length, not specially lengthened at the tip. The base is, as usual, coloured like the body; then follows a short zone (an inch above and three below) of dull buffy, the remainder, above and below, being blackish proximally and brown terminally.

The original specimen, a female by the description, though referred to as a male, was obtained by Natterer at Borba, on the Lower Madeira, about 300 miles west of the present locality, in 1830, and described by Wagner in 1845. It is now in the Vienna Museum, where I have examined it.

\* N. Dict. d'H. N. (2) x. p. 57 (1817); Mamm. ii. p. 291 (1822).

† The early French authors always described as “roux” what we should now call “buff,” not any colour we should look upon as “red.”

The measurements of the present specimen are as follows :—  
Head and body 189 mm. ; tail 236 ; hind foot 37 ; ear 16.

Fräulein Snethlage is to be congratulated on her rediscovery of this rare and interesting animal.

*Proechimys oris*, Thos.

♂. 7, 13, 15 ; ♀. 6. Boim (*Dr. Snethlage*).

♀. 18. Fazenda Paraizo, Faro (*O. Martins*).

♂. 21. Benevides, E.F.B., near Para.

The Boim specimens are mostly more brightly rufous than is usual in Para examples, but no. 6 is quite of the normal colour.

*Proechimys goeldii*, Thos.

♂. 19. Fazenda Paraizo, Faro (*O. Martins*).

This rare species may be recognized externally by its brown feet, the more bowed and heavier shape of the skull, and the extra laminæ in its teeth.

Besides the type the British Museum contains two separate skulls, also from Santarem, received from Dr. Goeldi, but the present is the first properly prepared skin that I have had the opportunity of seeing. Its hind foot measures 50 mm.

*Bradypus tridactylus*, L.

♀. 6, 15. Faro.

*Tamandua tetradactyla*, L.

Two specimens.

*Peramys americanus*, Müll.

♂. 24. Benevides, E.F.B., near Para.

*Peramys emiliæ*, sp. n.

♂. 4, 11 ; ♀. 12. Boim, R. Tapajoz (*Fräulein Snethlage*).

Coloration somewhat as in *P. scalops*, but belly paler. Teeth larger.

General appearance about as in *P. scalops*, the upper surface similarly grey ("mouse-grey"), turning to rufous on face and rump. Under surface dull pinkish buff, not sharply defined laterally, the hairs buffy to their roots ; but this colour in two out of the three specimens is overlaid by

the peculiar rose-colour referred to in Fräulein Snethlage's note below. Crown and face dull fulvous brown, the side of the face in front of the ear also fulvous. Ears short, rounded, practically naked, their few minute hairs fulvous. Rump rich rufous, almost "orange-rufous." Fore limbs greyish buffy above, pinkish buff on inner aspect; hind limbs rufous to ankles, buffy on inner aspect and feet. Tail rich rufous, in continuation with rump, above, pinkish buffy below; line of demarcation not sharply marked.

In specimens 11 and 12 the colour is darker throughout, the rump and tail being rather rufous brown than rufous.

Skull not of the peculiar slender muzzled shape of that of *P. scalops*, but more normal in outline, the muzzle evenly conical. Nasals long, greatly expanded behind. Supra-orbital edges square, though not sharply so, thickened, but not forming postorbital processes. Palatal vacuities small, opposite the first two molariform teeth.

Teeth of normal size, larger throughout than in *P. scalops*, the three upper premolars evenly increasing in size backwards.

Dimensions of the type (measured in flesh):—

Head and body 129 mm.; tail 60; hind foot 21; ear 15.

Skull: condylo-basal length 33.3; basal length 31.3; zygomatic breadth 18.4; nasals  $16 \times 5.7$ ; interorbital breadth 7.3; intertemporal breadth 6.1; palatal length 18.2; front of canine to back of last molar 13.3; breadth between outer corners of  $m^3$  11.4; three anterior molariform teeth 6.

*Hab.* as above.

*Type.* Adult male. B.M. no. 11. 12. 22. 16. Original number 4. Collected 13th September, 1911.

This very pretty little opossum, which is named in honour of its discoverer, has the general colour-scheme of *P. scalops*, although the rufous of head and rump is not so bright and the belly-hairs are not plumbeous basally. The skull, however, is quite different in shape.

With regard to the peculiar rose-colour now shown on the belly of no. 4 and in part of no. 11, Fräulein Snethlage writes:—"The first one that I got (no. 4) had the underparts of a rather vivid rusty red, which changed during the night to the rose-colour that it now shows. No. 11 was shot by my preparator among dry palm-leaves on the ground, and he assures me that its belly was already rose-colour when he picked it up; it certainly was when I saw it half an hour later." No. 12 has no trace of this rose-colour, which would seem to be akin to the fugitive purplish colour visible on freshly killed examples of *Lutreolina crassicaudata*, as I have myself seen in La Plata.



IX.—Notes on Phascogale and Chaetocercus.  
By OLDFIELD THOMAS.

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IN a small collection of mammals from Mount Goliath, Dutch New Guinea, obtained by Mr. A. S. Meek, there occur three specimens of a large and very handsome *Phascogale*, apparently quite unlike anything previously known. But among the species of this genus recently described by Dr. Jentink there is a certain *Ph. lorentzi*, nearly wholly black, and bearing in mind the frequency with which Phascogales are melanoid, I have made a careful examination of its characters—assisted by further notes kindly supplied me by Dr. Jentink—and now conclude that Mr. Meek's specimens belong to that species.

The following are the external characteristics of the non-melanoid specimens, which are all males, Dr. Jentink's example being a female:—

Size largest of the genus. Fur very long; the general mass of the dorsal hairs 12–13 mm. in length, the numerous longer isolated hairs attaining 21 mm. General colour above deep rich rufous, profusely speckled with whitish, the whole resembling the speckled colour of the back of *Ph. apicalis*, but far richer and deeper; underfur blackish at base, rich rufous terminally, long hairs with white subterminal bands and black tips. Sides more greyish, though still of the same freckled character. Under surface dull ochraceous buff or clay-colour, the hairs slaty at base. Head rufous brown, not freckled. Ears of medium length, their outer side whitish, inner side greyish brown. Forearms dull ferruginous; hands brown, claws very long, little curved. Similarly, behind, the legs are deep rusty, the feet brown, the claws very long and strong. Tail about as long as the head and body, its basal three inches furred and coloured like the body, the middle portion clothed with straight brown hairs about 6 mm. in length, closely adpressed, the terminal inch and a half white, the hairs of the extreme tip attaining nearly an inch in length.

The length of the skull attains 53 mm., and that of the three anterior molariform teeth 8.5 mm.

This fine species is the extreme of the fossorial branch of *Phascogale*, the genus tending to divide itself into two groups which it may hereafter be advisable to consider as genera. The one, typical, containing *Ph. penicillata* and the majority

of the Australian species, with short curved claws, broad flattened skull, and with  $i^1$  always markedly differentiated from the other incisors; and the second, of which *Ph. lorentzii* is the extreme, with long more or less fossorial claws, a narrow skull, rounded above, with long slender muzzle, and with  $i^1$  generally little or not differentiated from the other incisors. Into this latter group would come the Tasmanian *Ph. minima* and *seainsoni*, *Ph. apicalis*, nearly all the New Guinea species, and also *Ph. wallacei*, from which the generic name, if a genus were distinguished, would be *Myoictis*. But the line between the two groups is not very sharply defined, and the subject may, perhaps, be left for further investigation.

But one species, Krefft's "*Chaetocercus cristicauda*," hitherto placed in *Phascogale*, differs in such a marked way from all the others in its hypertrophied bullæ and peculiar feet that I think it should be recognized as generically different from the rest, and would therefore restore to it the name *Chaetocercus* given it by its original describer.

The following is a new subspecies belonging to true *Phascogale*:—

*Phascogale melanura modesta*, subsp. n.

Like typical *melanura* in all respects except that the rufous patch behind the ears is practically obsolete, the hairs corresponding to it slaty basally and only dull rufous just at their tips. Tail brown rather than black.

Dimensions of the typical skin:—

Head and body 106 mm.; tail 126; hind foot (wet) 20; ear (wet) 13.

*Hab.* Mount Goliath, Dutch New Guinea.

*Type.* Adult male. B.M. no. 11. 11. 29. 11. Collected by Mr. A. S. Meek.

*Ph. melanura* was originally described from two spirit-specimens, and on this account the brightness of the ear-patches was hardly sufficiently emphasized. A fresh skin of it, however, obtained by Mr. W. Stalker at Tamata, Mambare R., British New Guinea, has the patches bright ochraceous to the roots of the hairs, and a renewed examination of the alcoholic co-type in the Museum shows that this is the normal condition in the Eastern form.

X.—*Revised Determinations of Two Far-Eastern Species of Myospalax.* By OLDFIELD THOMAS.

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THANKS to the kindness of Prof. Trouessart I have been enabled to make a direct comparison of the typical skulls of *Myospalax fontanieri* and *psilurus* with the two series from Shan-si and Mantchuria, which I had recently referred respectively to those species, but on whose determination doubt has been thrown by Mr. Miller.

These doubts appear to have been well founded, the types differing enough in each case from the good series I have been able to compare them with to justify me in describing the latter as new.

*Myospalax fontanus*, sp. n.

*M. fontanieri*, Thos. P. Z. S. 1908, p. 978, nec M.-Edw.

Feet mostly naked, the hair only thinly spread on the proximal part of the metapodials.

Skull with the essential characters of that of *M. fontanieri*, which is no doubt its nearest ally. Size about as in that species. Muzzle normal in shape, more or less parallel-sided, not of the peculiar conical outline correctly indicated for the type in fig. 7 of Milne-Edwards's plate \*. Anteorbital foramen very much as in other species, *e. g.* as figured on the same plate figs. 1-3; its outline triangular with a deep notch below, its outer plate with a strongly developed projecting ridge running downwards past the foramen itself towards the palatal surface; the posterior upper bridge comparatively narrow. [In *M. fontanieri* the foramen is low from above downwards, its lower corner rounded, its outer wall not projecting forwards and scarcely ridged, its posterior upper bridge broad.] Interorbital region lengthened at the expense of the brain-case, the temporal fossa, as measured from the transverse masseteric crest to the sharply developed antero-external angle of the brain-case, much shorter in proportion to the true orbital region; the supraorbital edges sharpened. [In *M. fontanieri* the temporal fossæ are long, the orbital region short, the supraorbital edges rounded, and the antero-external corners of the brain-case not sharply angular.] Palatal foramina rather shorter than in *fontanieri* and mesopterygoid fossa slightly narrower. Molars quite similar

\* Rech. Mamm. pl. 8.

throughout, or perhaps a little broader, this depending in part on the age of the individuals. Incisors rather less obliquely twisted, more as in other species; those of the type of *fontanieri* with an unusual degree of slanting along their outer edges.

External dimensions of type (taken in the flesh):—

Head and body 203 mm.; tail 70; hind foot 35.

Skulls of adult male and female, the first the type: condylo-basal length 49·8, 48·5; condylo-incisive length\* 49·6, 47·9; zygomatic breadth 38·5, 35; nasals 19·5 × 8, 18 × 7·2; breadth of anteorbital bridge 2·2, 2·1; interorbital breadth 10·4, 9·1; length of masseteric fossa 13·3, 13·2; posterior breadth on transverse crests 37, 33; palatilar length 25·3, 25; palatal foramina 7·7, 7·3; upper molar series (alveoli) 12, 11·8.

*Hab.* Central Shan-si. Type from Ning-wu-fu, 6000'.

*Type.* Adult male. B.M. no. 9.1.1. 209. Original number 2001†. Collected 23rd June, 1908, by M. P. Anderson and A. de C. Sowerby; presented by H.G. The Duke of Bedford, K.G. Eleven specimens.

The considerable difference in the structure of the muzzle and anteorbital foramen affords quite sufficient reason for distinguishing the Shan-si mole-rat from that described by Milne-Edwards.

### *Myospalax epsilanus*, sp. n.

*M. psilurus*, Thos. Ann. & Mag. Nat. Hist. (8) iv. p. 503 (1909), nec M.-Edw.

External characters about as in *psilurus*. Metapodials thinly hairy, digits naked. A white coronal streak present.

Skull very like that of *psilurus*, but with certain constant differences. Nasals with their anterior third, after the first slight narrowing, again convex outwards on each side, about as drawn on the left side of Milne-Edwards's figure of the skull of *psilurus*‡; the figure is thus not correct, as in the type the two sides even diverge forwards, both sides being as drawn on the right of the figure. Anteorbital foramen with its outer wall not projected forwards above, or only very slightly in old age, the anterior profile-line from the shoulder of the zygoma to the muzzle joining the latter practically

\* An exceedingly old male, with greatly developed cranial ridges, has a condylo-incisive length of 51·2 mm., but I have not thought it advisable to select so exaggerated a specimen as the type.

† Accidentally enumerated among the females in my previous paper.

‡ Pl. 9 A. fig. 2.



without break, when viewed from above. In *psilurus* there is a strong projection forwards, as correctly shown in fig. 1, this projection being less, though still evident, in the younger specimens which alone I had previously been able to see. Throughout the series this difference is quite marked if specimens of corresponding age are compared, though the projection of old *epsilanus* is equal to that of young *psilurus*. Zygomata somewhat more widely spread. Interorbital region narrower, the crests approaching each other above much more closely anteriorly than on the parietals, these ridges being practically parallel in *psilurus*. Mesopterygoid fossa slightly broader.

Dimensions of the type (measured in flesh):—

Head and body 209 mm.; tail 43; hind foot 36.

Skulls of old male and female, the first the type: condylo-basal length 49.5, 47; condylo-incisive length 49, 46; zygomatic breadth 37.3, 32.6; nasals 18.3 × 9, 17.4 × 8; interorbital breadth across ridges on upper surface 4.7, 6.4; breadth across ridges on parietals 8, 10; posterior breadth on transverse ridges 31, 28; palatilar length 25.7, 24.5; palatal foramina 5.8, 5.4; upper molar series (alveoli) 11, 10.8.

*Hab.* Khingan Mts., Mantchuria, 3400'.

*Type.* Old male. B.M. no. 10.5.1.75. Original number 40. Obtained 15th June, 1908, by Mr. Alan Owston's collector Orié. Ten specimens examined.

This species is separable from *M. psilurus* by the different structure of the anteorbital region and parietal crests, these differences not coming out in comparison with the younger examples of Milne-Edwards's species, which alone I was able to examine in 1909. The respective localities of the two animals are about 1200 kilometers apart.

The specific name refers to the epsilon-like form of the upper molars, especially *m*<sup>3</sup>.

## XI.—A new *Nyctimene* from New Guinea.

By KNUD ANDERSEN.

### *Nyctimene certans*, sp. n.

Most nearly related to *N. cyclotis* (Arfak Mts.)\*, but dentition much heavier and colour of fur much darker.

Size as *N. cyclotis* or little larger (forearm of type 58 mm.);

\* Ann. & Mag. Nat. Hist. (8) vi. p. 623 (Dec. 1910).

ears as in *cyclotis*, unusually broad, semicircularly rounded off above, and narrowly edged all round with yellow, this yellow edge interrupted here and there by the dark central colour of the conch breaking through to margin of conch. Molariform teeth, as in *cyclotis*, subcircular in outline, with  $m^1$  and  $m_1$  conspicuously smaller than, respectively,  $p^3$  and  $p_3$ , but all teeth much heavier, particularly broader, than in the related species:  $p^3$  (length and breadth) of type (between parentheses corresponding measurements of the type of *cyclotis*, for comparison)  $2.2 \times 2.1$  ( $2.0 \times 1.7$ ),  $p^4$   $2.0 \times 1.8$  ( $1.8 \times 1.6$ ),  $m^1$   $1.8 \times 1.6$  ( $1.6 \times 1.3$ ),  $p_3$   $2.5 \times 2.0$  ( $2.3 \times 1.7$ ),  $p_4$   $2.3 \times 2.0$  ( $2.1 \times 1.7$ ),  $m_1$   $2.0 \times 1.7$  ( $1.9 \times 1.5$ ),  $m_2$   $1.3 \times 1.2$  ( $1.2 \times 1.1$ ). Colour of fur peculiarly mottled above, as in *N. cyclotis*, but much darker: individual hairs of back seal-brown at extreme base (for about 5 mm.), then very pale buffy wood-brown (for 5–6 mm.), with short (2 mm.) dark brown tips; the mottled appearance of the colour of the head and back due to the dark brown tips of the hairs being too short to cover completely the paler middle portion of the hairs; a narrow and somewhat ill-defined dark brown spinal stripe along posterior half of back; breast and belly pale greyish drab in centre, flanks fawn.

*Type*, skin and skull of an adult (unsexed), Mount Goliath, Dutch New Guinea, 20 Jan. 1911, collected by A. S. Meek, B.M. no. 11. 11. 29. 1. Two other specimens, from the Upper Aroa River, British New Guinea, are in the collection of the British Museum.

Thirteen species of *Nyctimene* are now known; of these no less than five are New Guinean, viz. *N. pipuinus*, *cyclotis*, *certans*, *geminus*, and *aëlo*,—no place has so rich a *Nyctimene* fauna as New Guinea.

XII.—*Notes, with Descriptions of new Species, on Aculeate Hymenoptera of the Australian Region.* By R. C. L. PERKINS, M.A., D.Sc., F.Z.S.

MEROGLOSSA, Smith, and PALEORHIZA, Perkins.

THE genera *Meroglossa* and *Paleorhiza* contain a large number of Australian bees of exceptional interest, owing to the fact that there is a quite unique sexual dimorphism in the mouth-parts. In the males the apex of the ligula, or tip of the tongue, is acute, while in the females it is of the

ordinary blunt form of the other *Prosopidæ*. It has been customary with some hymenopterists to speak of the *Prosopidæ* as being the most primitive of bees on account of the lingual characters, the blunt tongue being somewhat similar to that of wasps; but in many other respects they contain very highly evolved forms.

It seems to me now to be very doubtful, owing to the condition of the tongue of the male of these two genera, whether the blunt tongue is a primitive character at all, and not rather a special development, and that the pointed organ of the male may be the more primitive. It has always been perplexing to find somewhat similar blunt tongues in another family (*Colletidæ*), which otherwise has so little in common with the *Prosopidæ*. It seems hardly possible that the males of *Meroglossa* and *Paleorhiza* should have specially developed a tongue quite different from the females for any special purpose; but we do know that both the *Prosopidæ* and the very different *Colletidæ* have in common the habit of smearing their cells with a peculiar secretion, which forms a receptacle for the larval food stored therein. This work is of course done entirely by the females, and, so far as is known, is quite peculiar to the two families of bees that have these blunt or bifid tongues.

It should not be at all surprising to find that some males have not acquired the same structure of the mouth-parts, since they do not perform the same function. Somewhat analogous cases may be seen in other Hymenoptera, *e. g.* in the *Dryinidæ*, wherein the males in some genera closely resemble their females in important characters, while in others the females, being modified for a special purpose, become extremely different, the males remaining in a very unspecialized condition. This is so much the case that systematists have even placed in different subfamilies females whose males are with difficulty separable generically! Although the bees may have originated from some blunt-tongued fossorial wasp, I do not think that the blunt-tongued bees can be any longer brought forward as evidence of this.

Prof. Cockerell has remarked that *Paleorhiza* is but "at the best a subgenus" of *Meroglossa*; but I think it is a quite distinct genus, and unless one proposes to sink both genera in *Prosopis*, to which few, if any, hymenopterists would agree, it must be maintained. There is at present some difficulty in distinguishing females of both these genera from certain species of *Prosopis*; but this is no doubt due partly to insufficient study and partly to the fact that *Prosopis* itself

is not a homogeneous group of species, but itself contains a number of genera. Until entomologists will take the trouble to examine the male terminal segments and genitalia of *Prosopis* it is unlikely that any very satisfactory classification will be forthcoming. It is, of course, unfortunate that no equally good characters have yet been discovered in the females, but, doubtless, when the males are satisfactorily classified it will be possible to find characters in the more difficult females. Having at various times during the past six years done some little work on these Australian bees, I recently took the opportunity of examining the large collection in the British Museum, where are most of the very numerous species described by Prof. Cockerell and the late F. Smith. The time at my disposal was quite insufficient for a satisfactory study of more than a fraction of the total number of species, but these I examined fairly thoroughly. Many species I did not examine at all.

Males of *Palæorhiza* are easily distinguished from *Meroglossa* by the simple scape of the antennæ, which in the latter is always greatly swollen in a manner quite peculiar to the genus; *Meroglossa* also has the face extraordinarily channelled. *Palæorhiza* has a very simple form of genital armature, that of *Meroglossa* is very specialized.

In the female of *Meroglossa* the second segment of the abdomen has a very wide basal area, with the sculpture very different from that of the apical portion of the segment: the posterior boundary of this basal area is always strongly curved, so that it is longest in the middle line, and it is always more or less exposed. In *Palæorhiza* there is at most only a narrow basal transverse area, and it is entirely concealed, unless the second segment be unnaturally distended. Some species of *Prosopis* have in the female a basal area somewhat like that of *Meroglossa*, but these are otherwise quite different in facies.

The following species belong to *Meroglossa*:—*M. penetrata*, *M. canaliculata*, *M. eucalypti*, *M. sculptissima*, *M. sulcifrons*, *M. impressifrons*, *M. desponsa*, *M. torrida*, and *M. rubricata*. Of some of these I have only seen females, and no doubt there are other\* species amongst those I have not examined. *M. sulcifrons* and others have no doubt been wrongly placed owing to their resemblance in colour-pattern to certain Australian *Prosopis*, this pattern being entirely different from that of species heretofore described as *Meroglossa*.

\* Thus *Prosopis diversipuncta*, Cockerell, and presumably *P. nigrifrons*, Sm., should belong to *Meroglossa*.



To *Paleorhiza* belong *P. perviridis*, *P. reginarum*, *P. luxuriosa*, *P. varicolor*, *P. turneriana*, *P. parallela*, *P. perkinsi*, *P. denticauda*, *P. melanura*, *P. flavomellea*, and *P. basilura*.

*Meroglossa baudinensis* (which I have not examined), according to Prof. Cockerell, "from its evident affinities must be a *Meroglossa*" (incl. *Paleorhiza*); but I think this improbable, as I have taken the female of an allied species—probably *Prosopis cyaneomicans*, and this is not at all related to either *Meroglossa* or *Paleorhiza*.

It should be noticed that "the comb on the first two joints of the maxillary palpi," said to be a noteworthy feature of *Meroglossa* (incl. *Paleorhiza*), is also found (quite similar) in some of the Australian *Prosopis* proper, as described by Prof. Cockerell, and having no near relationship with *Meroglossa* (incl. *Paleorhiza*).

It is to be regretted that Prof. Cockerell should have been obliged to describe his species at intervals and without any opportunity to review the whole together with Smith's species. I feel sure that, should he do so, he would agree with me as to the distribution of the species in the manner given above, and no doubt, having studied a larger number of described species than I have, he could at once determine the position of the misplaced *Prosopis*.

I have not been able to dissect the male of any of the black species of *Meroglossa*, which have the scutellum and postscutellum bright yellow and have been described as *Prosopis*, as the specimens with this coloration that I possess are all females.

### *Meroglossa penetrata*, Sm.

It is remarkable that Smith should not have recognized this as a *Meroglossa*, as, apart from the sexual differences, the female has a great superficial resemblance to his *M. canaliculata*. I have observed this species in life at Bundaberg, where it was common. *M. canaliculata* I have received in numbers from Port Darwin. Prof. Cockerell has described a *M. lactifera* supposed to be allied to *M. penetrata*. I should think from the description that *M. lactifera* is certainly no *Meroglossa*, but either a *Prosopis* or *Paleorhiza*, and that the resemblance is superficial.

These comparatively big bees form a group (*Meroglossa* proper) very distinct from the *M. eucalypti* section (*Meroglossula*) of the genus. The sagittæ of the genital armature of the male extend to or beyond the apices of the stipites, whereas in *eucalypti* and its allies the sagittæ are very short

indeed and fall far short of the ends of the stipes. Moreover in the former the calcar of the hind tibiæ is conspicuously pectinate in the female, but not so in the *eucalypti* group.

In *M. canaliculata* the stipes are prolonged at the apex into a thin, recurved, elongate, downward-directed process, narrowed on the apical half; the membrane on the inner side of the stipes is ciliate with long bristles; outwardly beneath the stipes, before the apex, another lobe is seen beautifully and densely ciliated with long setæ. The apical processes are no doubt homologues of the membranous laciniae of the *eucalypti* group, and are connected with the inner membrane.

In *M. penetrata* the apical processes are very slender and almost filiform and wider on the apical than the basal portion; externally just before the point of origin of these processes several long bristles are placed on a strongly chitinized line, while internally the membrane is regularly ciliated with long bristles, as in *canaliculata*. The small lobe seen beneath the stipes at about the middle of its length forms an acute tooth bearing about four long setæ, anterior to which is another row of long setæ directed downwards beneath the stipes.

#### *Meroglossa soror*, sp. n.

Female black, shining, clothed with whitish pubescence; the head in front and the face bare or nearly so; the clypeus, cheeks, sides of face adjoining the clypeus, the plate above it, and the scape of the antennæ red. A minute and inconspicuous spot on the mesopleuræ, one on the tegulæ, and one on the axillæ yellow. Mesonotum shining, finely punctured, not very closely on the disc; postscutellum shining, the punctures finer than the larger-sized ones of the scutellum. Basal abdominal segment smooth, shining, finely and not densely punctured except towards the sides, where is a lateral apical line of pubescence, the other segments generally pubescent. Almost similar to specimens of *M. percrassa* taken by myself at Bundaberg except for the different colour of the head and the different markings. It appears, however, to have a more shining and less strongly punctured mesonotum and other slight distinguishing characters, and is a little smaller.

*Hab.* Queensland, Herberton district (*Dodd*).

*Meroglossa decipiens*, sp. n.

Face of male formed as in *M. sculptissima*, pale markings of thorax and tegulae as in *eucalypti*. Clypeus black on posterior half and the malar space black, the face otherwise like that of *eucalypti* in colour. Thorax black, abdomen reddish brown, subinfusate in parts. Stipites of the male genital armature continued into an elongate submembranous lacinia fringed with very long hairs on the apical part outwardly, and with shorter ones along its exterior margin, where it underlies the stipites for half or more than half the length of the latter; inwardly before the apex of the stipites it gives off on each side a chitinous, somewhat pointed, elongate process, furnished before the apex exteriorly with a single long bristle, the inner margin to the apex fringed with short hairs.

Female with thoracic markings of *eucalypti*, the head above black, the face red, the abdomen a dull red colour.

*Hab.* Port Darwin and Herberton district, Queensland (*Dodd*).

*Meroglossa deceptor*, sp. n.

Face formed as in *eucalypti*, the clypeus becoming dark (brown or pitchy) on a line with the lateral angles of its prominence; malar space dark or with a very fine apical line, otherwise coloured much as like *eucalypti*. Pronotum black or more or less obscurely reddish; mesonotum red, more or less sordidly infusate in some specimens; tubercles not spotted, dark; a spot on the tegulae and one on the axillae yellow; abdomen black, more or less reddish-tinted in parts, basal segment all black or largely red in the middle.

Genital armature with the submembranous lacinia much less developed than in the preceding; near the apex furnished with only two or three outer and three inner long setae instead of the regular fringe of many apical setae; the acute chitinous inner processes, which cross each other above the sagittae, bare, without hairs or setae. ♂.

It is uncertain whether these are distinct species or merely local races of *M. eucalypti* and *sculptissima*, with which they agree in size, sculpture, &c. It is observable that the species identical with *sculptissima* in superficial structure has almost the colour of *eucalypti*. I should have hesitated to give names to these forms but for the interest of the male genitalia, and in the hope that *eucalypti* and *sculptissima* may now be examined and described.

*Hab.* Cairns, collected by myself; Herberton (*Dodd*).

## PALÆORHIZA, Perkins.

In the males, apart from the clothing of the terminal ventral abdominal segments and the carinations of the third segment, a rather useful character is found in the shape of the apical margin of the second segment beneath. This is distinctly angulated in the middle in *P. perviridis*, *reginaram*, *perkinsi*, &c., rounded or nearly straight in *varicolor*, *parallela*, *turneriana*, &c.

The seventh ventral segment furnishes useful characters: this usually has the form of a pair of lateral processes or wings on each side, one being dorsal to the other, the ventral ones more chitinized and ciliated along the lateral margin.

The genital armature is very similar in all the species examined, the stipites simple, without lacinia or membrane, with long hairs at the apices. In *P. parallela*, however, the armature is very short, about as wide as long to the apex of the stipites. In all the others it is elongate. In *P. eboraquina* and *P. parallela* the very delicate inner (dorsal) membranous wings are extremely minute and delicate, not so long as the small ventral (more chitinized) triangular ones. In *P. varicolor* they are more developed and appear more chitinized and as long or longer than the upper, being also more pointed, but are without the cilia in the latter. In *perviridis* they are very long and twisted, extending far to the sides of the dorsal ciliated ones. In *basilura* the finely ciliated wings are butterfly-shaped, with black line at the base of the ciliae, and I cannot detect any underlying membranous pair.

I regret that I have no specimen of *P. melanura* or *P. denticauda* (which form a distinct section of the genus, with a regular longitudinal rugosity of the anterior area of the propodeum) for dissection.

The seventh dorsal segment is emarginate apically in all the species examined. Hardly the genital armature is accidentally a little protruded. This is the case in the type of *P. denticauda*, and the structures described do not belong to naturally external parts. Similarly, in *M. luxuriosa* the description "apex of abdomen with a pair of minute contiguous spines" refers to the tips of the sagittæ of the genital armature.

As to the females, *P. perviridis* (the male of which has the angulated margin of the second ventral segment) has the hind calcar strongly toothed, but the species which I have identified as *P. varicolor*, *turneriana*, and *eboraquina* (with simple second ventral segment in the male) are without these teeth. Should the angulated margin of



the male prove to be concomitant with the dentate calcar of the female, these will prove most useful characters. I was unable to examine the females of the British Museum species, from lack of time.

I have taken stylopized specimens of *P. eboracina*, and have *P. turneriana* thus affected.

*Palæorhiza muiri*, sp. n.

Very closely allied ( $\sigma$ ) to *P. perviridis cassiæ*, Cock., but very different in superficial appearance, of a much duller or darker green, changing to purple in different aspects. The wings are rather darker. The clypeal marking consists of a large triangular cream-coloured spot, not prolonged backwards behind the middle, two minute dots above the antennæ being sometimes also present; lateral pale markings narrower and only prolonged a little above the antennæ; no prothoracic spots. Puncturation of thorax and abdomen decidedly closer and slightly finer. Agrees with *perviridis* in the angulation of the margin of the second ventral segment, the lateral carinae of the third and fourth ventral segments, the general vestiture of the segments beneath (but the hairs are black), and for the most part in the genitalia and hidden seventh and eighth ventral segments. As in so many of the Australian *Prosopidæ*, the position of the recurrent nervures varies in individuals.

Length,  $\sigma$ , about 9 mm.

*Hab.* Amboina (*Muir*).

*Palæorhiza varicolor* var. *eboracina*, Cockerell.

I found this form, described on a single specimen, very commonly on various flowers during July at Cairns and also at Kuranda. As I have not received it from Dodd, nor was it collected in the Cairns district by Turner, I suppose it is in season during the cold months of the year, when collecting is considered poor in the district. Both sexes are extremely constant in the facial markings, and superficially quite unlike any *varicolor* that I possess. I have, further, seen no *P. varicolor* resembling the original type, and those that I myself took in the Cairns district are very constant, none resembling the original type, and still less are they like *eboracina*.

*Prosopis*, Fabr.

Australia is extremely rich in described species of *Prosopis*, and doubtless but a fraction of the existing species have been

collected. Many of the species so described were not true *Prosopis*, and after the removal of those that belong to *Meroglossa* and *Palaeorhiza*, the residue contains a complex of species belonging to a number of genera and subgenera.

I have here separated off two groups of species as distinct genera, but do not care to proceed further until I can obtain a larger number of species for dissection. There is no doubt that the terminal ventral segments and genital armature of the male are of great importance in the classification of these insects. In some cases the structure of the propodeum or median segment furnishes very valuable characters; but I do not think that it can be safely used for the formation of generic characters, unless these are corroborated by those of the male characters. Thus I have not thought it advisable to give any name to an important group of species with a remarkable flattened bifurcate process of the eighth ventral segment, since it includes species with very different propodeal structure, nor am I satisfied that the N.-American species with this structure are congeneric with Australian. The remarkable group of over fifty species of the genus *Nesoprosopis*, in the Hawaiian group of islands, show considerable variety of structure in the propodeum; but the terminal segments, while differing greatly in detail, are extremely uniform in their general features. While the extreme forms of *Nesoprosopis* might, by themselves, hardly be recognized as belonging to the same genus, the intermediate forms, still existing, show that all belong to a single series, and the male characters amply confirm this. Many neurational characters, considered of importance by some hymenopterists, are of very minor importance in *Prosopidæ*, owing to their instability even in individuals of the same species.

#### GNATHOPROSOPIS, gen. nov.

I propose this name for a group of Australian *Prosopis*, quite remarkable for the extremely short, wide, flattened mandibles, broadly truncated at the apex in both sexes, and with quite a different appearance from the comparatively narrow, strongly carinated organs of ordinary species. Most of the species known to me in the male have either tubercles or processes on the third ventral segment, a peculiar erect abdominal pubescence, and a more or less dilated scape to the antennæ.

Anterior area of propodeum seen from in front bounded by a raised line at the truncation, the area being rugose; posteriorly it is marked off by an impression and the surface

is smooth, or more finely rugose, quite different from the anterior portion. Lower margin of the stigma to the radius nearly straight, so that the stigma is not very large and receives the radius beyond the middle. First recurrent received before the first transverse cubitus or interstitial with it.

Type of genus, *Prosopis xanthopoda*, Cockerell.

Stipites of the male genital armature simple, no lacinia or membrane, pilose apically, the sagittæ reaching to the apex of the stipites, or a little longer. Eighth ventral segment produced in the middle into a more or less elongate process; this segment, therefore, entirely different from the group of Australian *Prosepis* (which also have the propodeal area rugose) with the eighth segment produced into long pilose bifurcations.

This is a very easily recognized genus, on account of the general similarity of the sexes in their mandibular structure, quite different from that of *Prosopis*, which has in the male a sharp apical tooth at least or is apically acutely bidentate. In *Prosopis*, also, the longitudinal carinæ of the mandibles enclose a narrow elongate triangular space, the apex of the triangle at the apex of the mandibles, where the carinæ meet or are approximate. In *Gnathoprosopis*, in the female at least, the mandibles have a peculiar vestiture, and in both sexes they leave only a very small basal portion of the labrum visible. The several species of which I have seen males have the face remarkably polished, almost oily in appearance. The dilatation of the scape appears to be developed *pari passu* with that of the processes of the ventral surface of the abdomen.

No doubt this genus is numerous in Australia, as I myself have taken several species and have specimens from Adelaide to Cairns.

*Gnathoprosopis theodori*, sp. n.

♂. Black, abdomen except the extreme base ferruginous. Mandibles, the whole face below the antennæ, the scape of the antennæ except above (where it is dark brown), a wide production upwards nearly to the top of the eyes from the facial colouring, the hind margin of the pronotum (narrowly interrupted in the middle), the tubercles, and a connection between these and the pronotal border yellow or creamy yellow; flagellum of antennæ ferruginous, a little paler beneath. Femora for the most part black or dark, but the middle ones are pale in front and down the middle posteriorly; tibiæ yellow, the middle and hind pair with dark

markings towards the apex; tarsi yellow, the front and middle ones more testaceous, except their basal joints.

Face below the antennae polished, very obscurely sparsely punctured. Head above dull, very densely finely punctured. Apical margin of supraclypal plate twice (or more) as wide as the length of its side to the antennal fossa. Scape strongly dilated, subovate, but not so wide as long. Mesonotum very dull and densely punctured, densely clothed with extremely short dark erect hairs and very sparse longer ones, which are more developed on the scutellum. Anterior area of propodeum shining, coarsely reticulately rugose. Wings clear hyaline, stigma and nervures fuscous.

Abdomen dark brown or fuscous on the basal portion and very deeply channelled in the middle above the petiole, unusually robust, shortly ovate, all the segments finely and closely punctured and densely and evenly clothed with longish erect pale pubescence, becoming fuscous on the apical segments. Third ventral segment produced into two great lateral dependent flattened processes, with the apices concave or emarginate, so as to form a large and a small apical angle. the segment deeply depressed behind the base between those processes; fourth segment with an oblique transverse carina on each side; sixth with a deep transverse fovea or impression on each side at the base.

♂. Length 7 mm.

By far the most remarkable of the *Prosopis caethopoda* and *bituberculata* group, as at present known, and perhaps hardly congeneric with the others. Genitalia very remarkable (probably abnormal for the genus), the armature with simple pointed stipites, pilose apically, the cardo unusually long; sagittae extending to or slightly beyond the apices of the stipites, dilated, with a prominent angle about the middle of their length. Seventh ventral segment emarginate apically in the middle, bilobate on each side, the apical lobes concavo-convex, large, the posterior narrow, elongate-ovate, and more membranous, neither lobes ciliate; apical process of the eighth very long, angulate at the top in the middle and with apical hairs.

*Hab.* Townsville, Queensland (*Dodd*).

#### EUPROSOPIS, gen. nov.

This may be considered by some as a subgenus only of *Prosopis*, but, I think, when that genus is properly classified it will be found worthy of full generic rank. *Prosopis husela* may be taken as the type of the genus.



In the male the genital armature is rather short and robust, with short incurved apical portion of the stipites, the sagittæ extending well behind these. Eighth ventral segment with long, slender, median apical process; seventh with well-developed lateral wings, and giving off at the apex, on each side of the middle, two very long, curved, slender processes.

The general characters are as follows:—The propodeum seen from in front is extremely short and bounded behind by a raised line or ridge, and within this area it is strongly rugose in all the species known to me. Behind this it is smooth, or comparatively so, over the rest of the anterior area (= basal area, enclosed space of metathorax, &c., auct.), which penetrates and (comparatively) widely separates the lateral elements of the propodeum by a wedge-shaped prolongation, which reaches nearly to the insertion of the abdomen. Small details of neururation vary even in different specimens of a single species, but the first recurrent nerve either meets the first transverse cubitus or is received a very short way within the second cubital cell.

There are two very distinct groups in this genus, viz., that of *Prosopis husela*, which like *elegans* has the calcar of the hind tibiæ of the female armed conspicuously with outstanding teeth or lamellate spines. In the male of *husela*, at least, the apical curved processes of the seventh ventral segment are beautifully clothed with hairs. In the other group, one species of which I have identified as *Prosopis disjuncta*, these processes in the male are without the remarkable vestiture, and the calcaria of the female are without the spines. To the genus in its wide sense belong species of very different superficial appearance, such as *husela*, which greatly resembles a species of *Euryglossa* described by me, other red-bodied species, black species with yellow scutellum and postscutellum, and species (except for small yellow markings) altogether metallic. All agree essentially in the peculiar features of the male terminal segments and genitalia, and in the structure of the propodeum as described above.

#### *Euprosopis husela*, Cockerell.

Male genital armature rather robust, the apical prolongations of the stipites pilose, short and bent inwards, not nearly so long as the wide basal portion, and not at all membranous, the sagittæ extending beyond them. Eighth ventral segment with a long, slender, apical process, curved ventrally, with a few feeble hairs at the sides, and a few distinct ones on the narrow apical margin, the apex not

dilated nor in any way peculiar. Seventh segment with large lateral wings, ciliated at the sides, the apex of the segment in the middle giving off two very long, outwardly curved, subfiliform processes, beautifully hairy and slightly dilated at their apices.

Prof. Cockerell thinks that *E. husela*, *elegans*, and its var. *huseloides* may be all forms of one species, but *husela* is easily distinguished from *elegans* var. *huseloides* by the mesonotal puncturation. Both seem very constant except in neuronal characters. The latter has a dense and almost rugose puncturation of the hinder part of the mesonotum in the middle, while in the former the punctures are much less close and leave considerable smooth spaces of surface between them.

I have seen very large numbers of *E. husela* from various localities, but comparatively few of *elegans* var. *huseloides* and all from Townsville. I have not seen the male of the latter, unless it be a form structurally the same as *P. rollei*.

#### HYLÆOIDES, Smith.

The Prosopid bees of this genus have a facies entirely their own, resembling Australian Eumenid wasps of the genus *Alaster*. Apart from their coloration, this resemblance extends to the remarkable structure of the second ventral segment of the abdomen, which is abruptly and greatly raised above the basal one (when the insect is reversed) and highest in the middle in front, so as to have a tuberculate form. Important generic characters are the narrow stigma, the very long second cubital cell, and the strong curved spine at the apex of the front tibiæ above. The wings appear to be capable of longitudinal folding like those of Eumenidæ, at least they are partly folded in some examples that I have received.

I have examined the genitalia only in the common Queensland species (*H. concinna*), which has a wide orange band on the first segment, the third and following segments orange. Genital armature elongate, the cardo short, the apical prolongations of the stipites narrow, pilose, elongate, longer than the basal part and not at all membranous; sagittæ reaching fully to the apex of these, dilated from near the base; together they are almost spoon- or racquet-shaped. Process of the eighth ventral segment twice as long as its greatest width, almost parallel-sided, only a little prolonged beyond the median thickening, the apex emarginate and clothed with long hairs; seventh segment widely

and distinctly emarginate in the middle apically, with a pair of lateral wings on each side, the one wing overlying the other—one pair suboblong, with blunt, subtruncate, lateral margin, rather inconspicuously ciliate; the other much narrower, dilated at the apex, with the basal lateral angle acutely produced and the margin conspicuously ciliated with long hairs.

Other sexual characters are a curved strong carina on the third ventral segment, defining a large flattened shining plate, and a shining transverse ridge on the fourth.

Another point of resemblance between this *Hyleoides* and some of the Australian Eumenidæ is the deep black second segment, the dull colour being due in both cases to a very dense appressed black tomentum, quite similar in the bee and wasps.

#### EURYGLOSSA, Smith.

This large and dominant Australian genus has been much studied by Prof. Cockerell, and he has formed new genera or subgenera for allied forms. Generally speaking, the Euryglossine section of the Prosopidæ are easily distinguished from *Prosopis* and its allies by the form of the tongue and by the mandibles, which have a more acute appearance in the females, owing to the apical tooth being well produced beyond the inner one. In *Euryglossa* itself, in some species the antecapical tooth is hardly, if at all, developed. A great many at least of the species of the Euryglossine section have the posterior tibiæ spinose or subspinose. *Euryglossa* itself in normal forms has much more of an Andrenoid facies than most Prosopidæ, and the females, in such species as I have been able to examine (as also those of the genera *Pachyprosopis*, *Turnerella*, *Euryglossina*, and probably others), have a small but distinct bare pygidial area. The calcaria of the hind tibiæ are notably spinose or serrate in such *Euryglossa*, *Pachyprosopis*, *Stilpnosoma*, and *Turnerella* as I have been able to examine; but they are also notably so in one group of species of *Meroglossa* and *Palæorhiza* in the Prosopine section and in some *Prosopis*, e. g. *P. elegans*, &c.

I have only examined the genitalia in one undetermined species of *Euryglossa*. The genital armature is long, very strongly rounded on the basal half, i. e. to the base of the sagittæ, which extend in dorsal view to the apices of the stipites. The latter are long and slender on their free portion, somewhat twisted, and with a roundish, more membranous, dilated apex turned outwards, a little like some species of *Andrena*. There are no long hairs or bristles,

but only very short and inconspicuous pubescence. The seventh ventral segment has the lateral wings ample, and they are strongly acutely produced at their apical angle, and bear and are ciliated with a peculiar short pubescence; at the apex of the segment in the middle between the wings arise, side by side, two small, hairy, elongate processes. The eighth segment is prolonged into a strong and very elongate chitinous process, widest at about the middle, with a dense and peculiar pubescence on its apical half.

*Euryglossa variabilis*, sp. n.

Very variable in colour, black, the abdominal pleura for a large part white: or ( $\alpha$ ) black, the fourth and fifth abdominal segments brightly ferruginous: or ( $\beta$ ) black, the whole abdomen, except the extreme base, ferruginous: or ( $\gamma$ ) black, the whole mesonotum and scutellum ferruginous, the abdomen black: or ( $\delta$ ) head black, mesonotum and scutellum ferruginous, abdomen, except extreme base and the fifth and sixth segments, ferruginous. Intermediate conditions also occur—*e. g.*, the apical margins of the second and third segments narrowly, the fourth very widely, and the whole of the fifth may be ferruginous. When the abdomen is black, this has a greenish lustre, but in the red-bodied specimens it disappears, and on the red parts in intermediates. The pleura remain largely white in all varieties. The legs also vary in the brightest forms, the tibiae and tarsi being sometimes clear testaceous; in dark varieties they may be black or pitchy.

Mandibles more or less red, the face at the sides densely clothed with white hairs. Clypeus shining, densely and finely punctured at the sides, plentifully, but more coarsely and irregularly, in the middle; frons dull and very densely punctured. Mesonotum very smooth and shining in the middle, where it is strongly and remotely punctured, but very densely in front and at the sides in front of the tegulae; scutellum shining, coarsely punctured in front, densely and more finely along the hind margin; postscutellum dull and very densely and roughly, finely punctate. Anterior area of propodeum smooth and shining, with microscopic surface-sculpture most noticeable in front and behind, rest of propodeum with white pubescence. Abdomen ovate, dull, with excessively dense microscopic surface-sculpture, not or hardly punctured; basal segment with short hairs basally, second, third, and fourth nearly bare or only with very short inconspicuous hairs, fifth with longer suberect hairs and an



apical fringe; pygidium elongate, narrow, its sides raised. Neuration ordinary, but varying in detail as in most Australian *Prosopidæ*, of which I have examined long series. Second recurrent nervure sometimes received far within the second cubital, as far as the first recurrent is from the other extremity, usually only slightly within this cell, sometimes interstitial with second transverse cubitus.

♂. Length 6-7 mm.

*Hab.* Bundaberg, Queensland.

*Obs.* Not having been able to compare it with the types of the many known species, I do not feel sure that this may not in some of its many varieties have been already described. It is very interesting from the definite character of its variations. My series was taken at random from hundreds of examples that were visiting the flowers of a small forest tree. There were no males present and the females were all engaged in brushing the pollen inwardly towards the mouth with the front legs in the usual *Prosopid* manner. A dozen specimens could be swept off at a single stroke of the net. There is no noteworthy variation, except in colour and details of neuration, the latter being similarly unstable in many other Australian *Prosopidæ*, so that the exact position of the recurrent nervures &c. is hardly worth referring to, unless one has examined a large series of examples. As to the colour-variation, I find similar cases in Australian *Prosopis*, those with a ferruginous abdomen having black-bodied forms also, in some of the species I have taken in numbers. Further, the abdomen may become conspicuously metallic (blue) in the dark varieties. For this reason these colour-differences are not to be taken into account for purposes of specific distinction, unless they are known to be constant.

*E. variabilis* must be very close to *E. myrtacearum*, if the latter is not identical with one of its colour-variations. However, in the former the first recurrent is generally, if not always, received well within the second cubital cell.

*Euryglossa euxantha*, sp. n.

Head mostly yellow, but the occiput and a wide transverse band including the ocelli, which is produced downwards on each side along the eyes for about half the distance between the top of the eyes and the line of insertion of the antennæ, are black. The yellow line formed between the black occiput and the black vertical band is narrow and irregular in outline. Lateral sutures of the clypeus on the basal half with narrow

dark lines, terminating apically in a short transverse line on each side. The lateral dark clypeal lines connect above with a dark spot, in which the antennæ are inserted. Mandibles dark apically. Scape yellow, rest of antennæ testaceous. Mesonotum black bordered with yellow, very widely at the sides in front, but the hind margin is black; two large discal longitudinal yellow bands, narrowing posteriorly, where they are connected by a transverse band a little in front of the black hind-margin; anteriorly they are incompletely separated, so that it might be said that a great oblong yellow spot, enclosing an elongate black triangle, occupies the whole middle portion of the mesonotum, except at the hind margin. Most of the pronotum, one or more spots on the tegulae, the tubercles, the mesopleura in front, a quadrate spot behind this, with a minute one below it, a large spot on the metapleura and a dot below it, yellow. Mesopleura, where not yellow, nearly black. Scutellum with the axillæ and postscutellum and nearly the whole of the propodeum, except the anterior area, yellow. Anterior area black, with three large yellow spots in a transverse row. Legs yellow, hind tibiæ and middle and hind tarsi more testaceous. Abdomen brown, the basal face of the first segment, and two great transverse wedge-shaped spots, almost forming a complete band, on the second, yellow.

Clypeus and plate above it shining and feebly irregularly punctured, the front of the head below the ocelli dull, with distinct fine but very shallow punctures more evenly distributed. Mesonotum dull, with fine, remote, and very shallow punctures. Anterior area of propodeum dull, with only microscopic surface-sculpture. Abdomen more shining than the thorax and with shallow puncturation on the more apical segments. Spur of hind tibiæ with regular lamellate spines decreasing in length towards apex, the basal ones very long. Neuration, except subcosta, mostly pallid yellowish, as also the stigma.

♀. Length 6 mm.

*Hab.* Port Darwin (*Dodd*).

*Heterapis halictiformis*, sp. n.

Male very slender and elongate, with clavate abdomen. Black, the whole face below the antennal fossæ and a broad orbital prolongation upwards, not reaching the top of the eyes, the mandibles, malar region, scape of the antennæ in front, the front coxæ, the hind margin of the pronotum and the tubercles, yellow. Flagellum of antennæ pale

ferruginous beneath, infuscated above. Teguke pale, yellowish, with a dark spot. Front legs clear, pale yellowish brown, middle ones more brightly yellow, the femora with a small dark mark behind, the tibiae with a rather larger one. Hind femora black, tibiae yellow on the basal portion; the rest of the tibiae and tarsi having been broken off their colour is uncertain.

Head large, subquadrate on the vertex, sides of face evidently punctured, the face shining, strongly and evenly convex in profile, above the antennae much duller and very densely punctate, vertex smooth and shining between the ocelli and externally to there. Antennae long, the scape elongate, nearly parallel-sided, distinctly, but not strongly, arched beneath; second joint nearly globular; third very small, transverse; fourth elongate, twice or more than twice as long as the third; the following joints all elongate and becoming thicker towards the apex of the antennae. Mesonotum shining, with distinct punctures, inclining to rugulosity; scutellum also shining, sparsely punctured; post-scutellum very dull. Propodeum seen from above with excessively long dorsal face, as long as the scutellum and postscutellum together, very dull, with extremely dense and minute granular appearance, the brow and posterior face smooth and shining, the latter with a great and deep median fovea. Abdomen clavate, third segment twice as wide as the first, pitchy brown on the first two segments, beneath and towards the apex with very scanty, longish, erect, white hairs, which are quite conspicuous. The surface is shining, for the most part without definite sculpture, with feeble, shallow punctures on the more apical, piligerous segments.

♂. Length 3 mm.

*Hab.* Bundaberg, Queensland, in June.

### EURYGLOSSINA, Cockerell.

#### *Euryglossina cockerelli*, sp. n.

Black, the apical part of the mandibles and labrum more or less reddish; clypeus and plate above it black; antennae pale beneath, fuscous above, tubercles and a spot on the tegulae bright yellow. Front femora black, the tips as well as the tibiae and tarsi yellow. Middle and hind legs pale, but not of the bright colour of the front ones, the femora dark in front and behind, and the tibiae infuscated above. Abdomen dark brown or pitchy with a purplish lustre, the pleura and ventral surface as well as the extreme apex

yellow. Neuration, except the subcostal, very pallid yellow, the stigma pale and hyaline except the brownish-yellow margin.

Examined under a strong lens the sculpture, &c., is as follows:—Clypeus shining and with evident, fine punctures. Head and mesonotum not quite dull, in spite of the dense surface-sculpture, puncturation not or hardly discernible, on the scutellum a very fine puncturation is observable; propodeum seen from in front more shining than the mesonotum; abdomen somewhat shining, without definite sculpture. First recurrent nervure received well before the second cubital cell, which is about as wide as its greatest height. Lower side of first cubital straight.

♀. Length 4 mm.

*Hab.* Bundaberg, Queensland, collected by myself.

### TURNERELLA, Cockerell.

#### *Turnerella doddi*, sp. n.

Colour and appearance very like *Euryglossina cockerelli*, but the whole face below the antennæ is red, and this colour extends for some distance above the base of the mandibles behind the eyes. Scape of antennæ and flagellum beneath red or reddish. Abdomen of a pitchy or more or less sordid brown colour, darker apically, and with yellow tip, the basal concavity yellowish, the dark parts with purplish reflections. Tubercles, tegulae, venter, and pleura of the abdomen, as well as all the legs, bright yellow. Neuration like the preceding, but the second cubital wanting.

Clypeus forming a very distinct obtuse angle with the plate above it; mandibles acute, the apical tooth being well produced beyond the inner one. Front of head with very fine remote punctures quite evident. Mesonotum very dull, the minute punctures indistinct, much more numerous and more distinct on the scutellum. Propodeum seen from in front smooth and shining. Abdomen without definite sculpture.

♀. Length 3.5 mm.

*Hab.* Port Darwin (*Dodd*).

### NEOPASIPHAE, gen. nov.

I propose this name for a male insect which has somewhat the appearance of *Euryglossa* with extraordinary sex characters.

Mandibles bidentate, the apical tooth much the longer and



rather sharp; labrum short, transverse, hardly seen beyond the clypeus in a front view of the head. Scape of antennæ flattened and enormously dilated. Hind femora and tibiæ greatly incrassated, the metatarsus greatly dilated, apex of middle tibiæ armed with a stout spine. Wings with first and second cubital cells nearly equal in length; stigma very narrow, lanceolate; lower side of first cubital cell straight, not the least curved; submedian cell a little longer than the median: first recurrent nervure slightly within the second cubital, second about one-fifth the length of the lower side of the cell from its extremity. Tongue not visible; maxillary palpi apparently six-jointed, ordinary. The apex of the eighth ventral segment and of the stipites of the genitalia, which happen to be exposed, are Andreniform in appearance.

Whether this is really allied to *Pasiphae* is, of course, doubtful, seeing that the unique example, without dissection, can only be very imperfectly examined. There are examples of two species under *Pasiphae* in the British Museum collection, all the individuals, I think, being male. One of these has the tongue protruded, and it is a very elongate organ, not in the least like that of *Euryglossa*.

*Neopasiphae mirabilis*, sp. n.

Black, the clypeus, mandibles, scape of antennæ, flagellum beneath, an apical band on all the abdominal segments, yellow. These bands with two emarginations in front. Front femora and tibiæ yellow, the former for the most part black above, the latter with a large black mark, tarsi yellow; hind femora and tibiæ for the most part black, but both are yellow at the apex and the latter have a pale line along the front margin.

Scape of antennæ greatly dilated, flattened, and subrotundate, the inner margin evenly rounded, the outer for the most part nearly straight. Head and thorax clothed with long pale hairs, the whole insect with the surface very dull. Thorax very densely sculptured with very fine puncturation, appearing more or less granulate. Anterior area of propodeum defined by a slightly impressed line and by the absence of pubescence. Abdomen excessively densely and finely sculptured, very dull, clothed with sparse longish pale hairs; the legs thinly clothed with long pale hairs. Hind femora and tibiæ greatly incrassated; the metatarsus subrotundate and much wider than the greatly incrassated tibia, its hind margin fringed with very long pale hairs.

♂. Length 10 mm.

It is not clear whether the appression of the pubescence of certain parts is natural or otherwise, the specimen appearing to be in a rather dirty condition.

The type is in the British Museum.

*Hab.* W. Australia, Violet Range (*E. Murchison*).

### Nomadidæ.

#### NOMADA.

This genus is only known in Australia from Queensland, where but a single species, here described, has so far been discovered. Considering the abundance of Andrenid bees of the genera *Halictus* and *Parasphcodes*, one might expect many species of *Nomada*, parasitic on these; but such is not the case, and it is probable that this genus is a comparatively recent arrival. It is a small and obscure species, and apparently not very common. Turner has taken it at Mackay and Cairns, and I have received the female from Dodd from the latter district.

#### *Nomada australensis*, sp. n.

♂. Head and thorax black or nearly so; mandibles, cheeks, labrum, clypeus, a narrow line along the inner orbits reaching the vertex, antennæ beneath, the scutellum and postscutellum pale yellowish brown. Antennæ mostly dark brown above. Pronotum posteriorly and mesonotum laterally rather obscurely bordered with red; mesopleura pale, yellowish brown. Legs brown, the front pair and the hind and middle tibiæ paler than the hind and middle femora, but the tibiæ are more or less infuscate behind. Abdomen dark or blackish brown, more or less paler at the articulations of the segments; second segment with a round pale yellow spot on each side, third with a much smaller one not visible in dorsal aspect, fourth and fifth with paired spots, sometimes concealed by contraction of the segments.

♀. Generally like the male, but the antennæ are paler above, the whole face reddish except the middle part above the antennæ. Mesonotum entirely reddish, except a dark median line; legs uniformly brownish yellow. Third and fourth abdominal segments with very dense lateral apical fringe of white appressed hairs. Wings in both sexes distinctly clouded round the margins, venuration dark.

Face densely clothed with white appressed hairs; mandibles acute. Third antennal joint very similar in each sex, elongate, much longer than the fourth, this and the following

joints being subequal. Mesonotum shining between the coarse punctures, which are rather sparser in the female than in the male, distinctly longitudinally impressed down the middle and more or less distinctly on each side of this. Anterior area of propodeum rugulose, beyond this with dense and conspicuous appressed white plumose pubescence; scutellum subprominent on each side. Abdomen with only very feeble punctures, the apical margins of the segments widely impunctate. Apex of hind tibiæ of the female with two very short but distinct blunt spines. Owing to the pale hairs the spines are difficult to see in the male, but I detected two in one of the examples.

♀. Length 6 mm.

The type is in the British Museum.

A variety from Mackay has the clypeus largely black in the middle and the orbital lines very widely broken.

*Hab.* Cairns (Turner, Dodd); Mackay (Turner).

#### Ceratinidæ.

##### NEOCERATINA, gen. nov.

General form and appearance of a smallish *Ceratina*, similar mandibular characters, but the maxillary palpi with only five joints, the first two by far the longest, the second about twice as long as the third, which is subequal to the fourth, the fifth being slender and acuminate. The first joint is of peculiar form, much more solid than the second, and thickened on its basal portion, in length not differing much from the latter. Wings with the second transverse cubitus strongly curved, nearly meeting the first transverse on the radius, the recurrent nervures received a short and about equal distance within the second and third cubital cells respectively.

Shuckard gives the generic characters of the well-known European *Ceratina cyanea* at some length; the maxillary palpi as "6-jointed, the three first joints subequal, the three terminal gradually decreasing in length." This agrees in general with a North American species which I dissected for comparison. This has three long basal joints, not differing much in length, but the fourth is very short, the fifth rather longer, the sixth slender and acuminate. The Australian insect is therefore very different from these.

##### *Neoceratina australensis*, sp. n.

Female black, with slight æneous tinge; abdomen with

the basal segments more or less pitchy and the apical margins pitchy red. A wide stripe down the middle of the clypeus, the prothoracic tubercles, a spot at the base of the middle tibiae above and a line on the front and hind ones, white. The legs pitchy brown. Wings hyaline, somewhat smoky; neuration dark.

Face below the antennæ polished, and at the sides with sparse coarse punctures, impressed along the margins of the clypeus, the latter impunctate down the middle; a dense puncturation on the inner side of the great impressions, in which the antennæ are inserted, these being elsewhere smooth. Head seen from above with a flattened punctate area, on which the front ocellus is placed, the vertex with coarse punctures. Mesonotum finely and densely punctured and dullish, but with two highly polished areas postero-laterally, whereon there are few punctures, and in fact on part of these areas none, but they are traversed by an impressed line. Scutellum densely punctured all over. Propodeum in front dull, with dense minute surface-sculpture, appearing granulate. Basal abdominal segment finely and somewhat irregularly punctured; second and third very densely and finely punctured, but with a smooth transverse submedian impunctate line, which is interrupted in the middle by a punctured portion; fourth, fifth, and sixth with extremely dense and fine puncturation and remote minute tubercles. Abdomen above with very short sparse hairs, beneath with much longer pale ones; sculpture of ventral segments very dense and rough; scopa pale.

♀. Length 4.5 mm.

*Hab.* Bundaberg, Queensland; taken by myself in 1904.

*Obs.* This is so far the only representative of the family Ceratinidæ in Australia.

### Eumenidæ.

#### ISCHNOCÆLIA, Perkins.

This genus is entirely distinct from *Elimus*, Saussure, which it superficially resembles, by the quite different mouth-parts. There are several species of each of these genera in the British Museum collection.

#### ECTOPIOGLOSSA, gen. nov.

General form and appearance of a yellow-and-black *Eumenes*. Antennæ of male 13-jointed, the twelfth very small, forming a base for the recurved hook-like thirteenth



joint. Clypeus bidentately emarginate in both sexes. Middle tibiae with a single calcar. Second cubital cell triangular, the sides meeting above (or almost meeting) at the radius, receiving the first recurrent nervure far along its lower side at one-third or more of its length from the first transverse cubitus, second recurrent received at not half so great a distance from the second transverse cubitus. Abdominal petiole gradually widening from base to apex, about as long as the thorax. Labium with a very elongate linear ligula, which is hairy for nearly its whole length, and bifid at the apex. Labial palpi long, the basal joint incrassate, thickening apically, but many times as long as its greatest width, set on one side with bristly hairs; second long and slender, but much shorter than the first, thickened at the apex, and there set with two long curved bristles; third slender and elongate, but much shorter than the second, and also armed with two curved apical bristles; fourth spine-like, not more than one-third the length of the third and much shorter than one of the curved apical bristles of the latter. The palpi of the male are very similar, but they are more slender and the bristles less developed. Maxillary palpi very short, three-jointed, the whole not longer than the third joint alone of the labial palpi; basal joint elongate but stout and clavate, second very small, but stoutish, third a mere rudiment and very minute. Inner edge of mandibles (♀) with three smaller apical teeth, followed by a very wide one with concave free edges and as wide as the other three together.

*Ectopioglossa australensis*, sp. n.

Black, clypeus, a large spot above it, pointed above and nearly reaching the ocellus, the inner orbits from the clypeus to the top of the sinus of the eye, the posterior orbits, sometimes a dot adjoining each of the exterior ocelli, a band on the pronotum dilated at the sides and slightly interrupted in the middle, a large spot on the mesopleura, two curvate lines on the anterior part of the mesonotum in the female, two spots on the tegulae and one adjoining these, two large spots on the scutellum, sometimes united, two great spots on the propodeum, which are deeply emarginate exteriorly, an apical, slightly interrupted, band on the basal abdominal segment, two spots at the base of the second as well as a complete apical band on this and the two following segments, the whole (or nearly) of the front tibiae and a large part of the femora, a spot at the apex of the middle femora and the tibiae above, pale yellow. Head with very sparse larger

punctures and the interstices distinctly punctulate. Mesonotum shining (more so in the male), with very sparse and feebly impressed punctures of larger size and a finer puncturation, which is also indefinite or very feeble, clothed like the head with short, erect, black hair. Propodeum smooth and shallowly punctured, widely channelled and rugose down the middle, its posterior lateral angles dentate or spinose. Abdomen clothed with excessively short hairs, the apical margin of the petiole raised or reflexed. Wings shining fuscous, brassy in some lights.

♂ ♀. Length to apex of second abdominal segment 9-14 mm.

*Hab.* Cairns, Queensland.

### ABISPA, Mitch.

The antennæ in the male of this genus are remarkable for being only 11-jointed and quite simple. The Australian *Alastor* likewise has eleven joints in the male, but only eight of these are apparent, the three terminal ones being extremely minute and more or less sunk in a cavity of the eighth joint. Sometimes they are so small as to appear as a mere tubercle, even under a very strong lens. The eight apparent joints are, most of them, unusually lengthened, giving the antennæ a characteristic appearance.

### *Abispa odyneroides*, sp. n.

General colour the same as that of *Odynerus abispoides*, described below, but the mandibles are darker, reddish, the yellow in the sinus of the eye does not continue down to fill up the space between the clypeus and supraclypeal plate, but is continued upwards nearly to the top of the eyes, the pronotum is entirely black.

Clypeus very deeply and widely dentately emarginate. Antennæ (♂) 11-jointed, the third subequal to the fourth and fifth together. Head in front with dense reddish hair. Mesonotum dull, very rugosely punctured, clothed with very short, erect, dark hairs, those on the scutellum pale; post-scutellum tridentate, the lateral spines short, blunt and obscure, the median one erect and sharpish; propodeum rugose from the very dense puncturation, the hind angles hardly prominent, in some aspects subrectangular. Basal abdominal segment shallowly, but distinctly and rather evenly punctured, the whole surface of the abdomen very dull from the sericeous dark tomentose clothing. Transverse sulcature of second ventral segment deep, the costæ

few and feeble; third and following segments very densely clothed with orange-coloured woolly hair; second basally with black erect pubescence. Wings on the costal portion orange, elsewhere less deeply coloured, some violet iridescence apically.

♂. Length to apex of second segment 24 mm.

The resemblance between this species and the next is quite remarkable and is not merely one of colour, but the general form of the clypeus, mandibles, and propodeum is also concerned. Of course there is really no affinity, the genera being entirely distinct.

*Hab.* New Guinea (*Pratt*).

*Odynerus abispoides*, sp. n.

Black, the mandibles excepting the teeth, clypeus, supra-clypeal plate, the sinus of the eyes and a line between this and the clypeus, the posterior orbits, two large spots on the pronotum, the hind angles of the propodeum, the antennae, tibiae, and tarsi, and an apical band on all the abdominal segments (that on the first segment paler) orange.

Mandibles long and slender, projecting, when crossed, by more than half their length beyond the apical angles of the clypeus, the latter widely and deeply dentately emarginate, feebly punctured. Apical joint of male antennae strongly curved, long, much longer than the twelfth, which is itself elongate and much smaller than the preceding. Head in front coarsely rugosely punctured, the vertex subincrassate. Pronotum coarsely and closely punctured, mesonotum very small, much less closely and coarsely, the surface covered with dull black dense tomentum concealing the surface. Scutellum coarsely punctured, the punctures distinct. Propodeum rugose, with very close punctures, finer than those on the scutellum, the hind angles produced into a prominent spine. Abdomen deep dull black from the tomentose covering, which in some aspects almost hides the shallow puncturation, the basal segment foveate near the apex in the middle. Second ventral segment with short costae, behind these it is widely flattened and has a shortish median impressed line. Wings orange on the costal portion, the nervures rather darker.

♂. Length to apex of second abdominal segment 14 mm. Belongs to the *Leionotus* section, as generally accepted.

*Hab.* New Guinea (*Pratt*).

XIII. — *A Review of South-African Land-Mollusca belonging to the Family Zonitidæ.* By Lt.-Colonel H. H. GODWIN-AUSTEN, F.R.S. &c.

[Plates I.-VII.]

*Introduction.*

FOR some years past Messrs. James Cosmo Melvill and John H. Ponsonby have contributed valuable conchological papers to the 'Annals and Magazine of Natural History' on the South-African Land-Mollusca; their 'Check List of Non-Marine Mollusca' is a record of some 21 families, containing 57 genera and 367 species from that part of the world. Up to the present time our knowledge of the animals of African land-shells is very limited, and when I received from Mr. John Ponsonby, some years ago, several specimens of a species preserved in spirit from Port Elizabeth, examination showed considerable divergency from the Australian genus *Helicarion*, to which it had been assigned, the type of which is *H. cuvieri*, Fér. (vide Moll. Ind. vol. i. 1883, p. 146, pl. xli. anatomy of *H. heleneæ*, G.-A.)\*, still more did it differ from Indian species which had been placed by various authors in this genus *Helicarion*. Very soon after my first examination of the animal sent to me as *Helicarion hudsoniæ* it was evident that it had no representatives in the Indian and Malay region, and the genus *Peltatus* was created for it in 1908.

During the last few years, however, valuable material has been collected and sent home by Messrs. M. Connolly, Henry C. Burnup, J. Crawford, J. Farquhar, and others, while Mr. John Ponsonby has twice visited South Africa. In the conchological work, the determination of the species, Messrs. Ponsonby, Connolly, and Burnup have devoted all their knowledge and time, and the two latter gave me many valuable notes on the animals they collected. They have most kindly placed the spirit-specimens in my hands for examination—truly a splendid series of species and varieties from numerous widely separated localities, mostly in a beautiful state of preservation. As this material came

\* This species is the same as *hyalina*, Pfr. Mr. Brazier states that the examples obtained by Godwin-Austen were from a colony introduced from Queensland: Proc. Linn. Soc. New South Wales, 31st December, 1890, "On the Naturalized Forms of Land and Freshwater Mollusca of Australia." See form of the animal. Moll. Ind. i. pl. xli., reproduced from an excellent water-colour drawing from life by Mrs. H. Forde (1870).



to land, it became apparent that we were dealing with forms representing a distinct branch of the great family Zonitidae—a branch given off from the parent stem in the remote past, and long isolated in Africa from branches in other lands, such as the Ariophantinae and Macrochlamyinae of India.

Following the course of evolution and breaking up into generic divisions, it was interesting to observe how a similar and parallel development of parts had gone on in two widely separated areas. It has been my aim, in this study of comparative anatomy of the African species of Zonitidae under review, to construct a classification somewhat similar to that of the Asiatic representatives of the family as built up by the labours of Semper, Stoliczka, and others. Occupied with other work, I much regret the delay which has occurred in publishing the results; it must be remembered that the material to examine, though large, was very unevenly distributed among species, some being represented by several specimens, many others (often undetermined) by only one. It is very difficult to secure a satisfactory knowledge of all the internal anatomy with only a single animal to deal with; to wait for more material would perhaps mean years.

With regard to the animal, I cannot say too much as to the importance of making notes and, if possible, drawings of them when freshly taken. Colour is destroyed in spirits, and we want to know to what extent the lobes cover the shell, and in those species where the lobe at the extremity of the foot is much elongated, to what extent, and how it is carried in life. In contracted spirit-specimens (and all the drawings in this paper have been made from them) the true form and size can only be estimated; fortunately, having seen and kept many of the Indian slug-like forms alive, I have been able to form a fair idea of what these African snails are like.

Notice, by collectors in the field, should be taken of the coloration and markings of the animal generally, especially that of the visceral sac when the shell is removed. When I took up the examination of this African group of mollusks my attention was called very early to the great variability displayed in the visceral sac. Beginning with the edge of the mantle, the wall of the branchial cavity and the region of the kidney and heart were often beautifully mottled and streaked in various ways, in one or more colours—in rounded spots or streaks, either fine or coarse; and although not absolutely identical in arrangement in every specimen of the same species, yet on the whole it was a typical distribution of colour. Spotting in some cases would be continuous to the apex, while in other species there was no spotting at all,

and in its place some uniform tint pervaded the whole visceral sac up to its position in the apical portion of the shell.

I was first led to notice specific variation in this part of the animal lying within the shell when going over a large collection of species of *Macrochlamys* from Sikkim. I have laid stress on the character very fully in the descriptions of species in this paper, trusting that it may be useful in their determination, particularly of local varieties.

It is apparent and worthy of notice that these South-African snails, hitherto placed in the genus *Helicarion*, have characters, external as well as internal, not at all like those of typical species of the genus, viz. *H. curieri* and *hyalina* of Australia, previously alluded to.

They differ also from species inhabiting India and the Malay Archipelago, Malayana, &c., at one time also placed in *Helicarion*. I have good grounds, therefore, for locating the South-African species in a new subfamily, for which I propose the name *Peltatinæ*, particularly as the species I have now examined from South Africa can be readily separated into several well-defined genera.

Unfortunately I have not that personal knowledge of the physical features and the local distribution of the fauna and flora of South Africa which is so desirable when writing a paper such as this. All I have seen of the country is the immediate neighbourhood of Cape Town and Simon's Bay, for the vast extent beyond that I am indebted to books of travel and meeting those who have been there.

Like Southern India it is a land of great antiquity, a very large portion not having been beneath the ocean since pre-Cretaceous times, during which vast changes in sea and land were going on in other parts of the world. There was a period indefinitely associated with the outburst of volcanic activity in Southern India when the two countries had a land-connection. This renders a study of the molluscan fauna of Africa of such extreme interest. Wm. Blanford, writing so long ago as October 1876, in the pages of this journal (vol. xviii. p. 277), on "The African Element in the Fauna of India," says: "I was especially desirous also of working out the very difficult question of terrestrial Mollusca, the distribution of which, as Mr. Wallace has just pointed out in his 'Geographical Distribution of Animals,' whilst agreeing in some respects with that of the Vertebrata, presents some very singular anomalies." In this family of the Zonitidæ, although we do not find a single genus common to Africa and Southern India, yet there is

this curious similarity. The Peltatinæ in the former country hold the same position the Ariophantinae do in the latter.

The remarkable variation in anatomical detail met with in the species of this subfamily has, I suggest, some relation to the very great extent of country over which they are distributed, and still further to be accounted for by the extremely long isolation each species has probably undergone in its own particular habitat.

The physical nature of the country and the great distances across high, arid, treeless tracts point to this, and isolate more widely than usual the localities from which the animals described in this paper have been received. A glance at the map of South Africa will show this more clearly. Thus from Cape Town north-east to Pretoria is 800 miles, from Cape Town eastward to Port Elizabeth is some 400 miles, and another 425 or so on to Natal with Durban and Maritzburg, while from this last place to Pretoria is over 300 miles. Most of the intermediate country between these localities does not appear to be of a climatic nature conducive to the rapid extension of mollusks of this kind possessing extensible lobes to cover the shell; their habits and requirements necessitate a considerable amount of moisture. They could only unrestrictedly move along the lines of main drainage or the more wooded jungle-clad slopes of the lateral ranges.

Species very similar in shell-characters are found far beyond the area I have above indicated, many of which I have noticed in the Natural History Museum, but as the animals of these species are not yet known they can only be placed provisionally in the Peltatinæ.

Further north, in Africa and in Abyssinia, we know that *Helicarion*-like shells of the family Zonatidae occur, represented by the genus *Africarion*, type *pallens* or *lymphaceus*, Morelet, described by me in the 'Mollusca of India,' vol. i. pp. 154-158, pl. xlii. As we obtain further malacological knowledge of these species, their true geographical distribution and limits of range and their relationship will be of extreme interest.

Even while preparing this paper, my attention has been called to a very excellent, valuable contribution to our knowledge of African land-shells by Professor Dr. J. Thiele, entitled 'Mollusken der Deutschen Zentralafrika-Expedition,' 1907-1908. This expedition, under the leadership of Adolf E. Herzog zu Mecklenburg, has been productive of good work, and Professor Thiele describes a large number of new species in many genera. Some eight species are re-

ferred to *Helicarion*, three to *Vitrina*. The value of the paper is much increased by the figures of the generative organs given on plate vi. Among these it is interesting to note how similar in every way are these organs in no. 60. *H. kivuensis*, Thiele, no. 63. *H. schubotzi*, Thiele, and no. 59. *H. semi-membranaceus*, v. Martens, to the species of South Africa which I place in the Peltatinæ, particularly in the first two species. In no. 60, *kivuensis*, what is marked (*d*) is evidently the flagellum coiled up with the accessory gland as seen in *pharidinus*, M. & P., and will be figured in the next part of this paper, while the form of the spermatheca is precisely the same. In no. 63, *H. schubotzi*, the penis is separated out and all its parts are distinctly displayed, the flagellum given off close to the vas deferens, the accessory gland on the epiphallus, peculiarly long in this species.

A glance at this plate shows some other very distinct groups to exist in Africa. In fig. 69, *Helicarion auriformis*, Thiele, can, I suggest, be placed in *Africarion*, while no. 58, *H. plicatulus*, v. Martens, evidently waits to be placed in a new African genus yet to be described, one possessing an amatorial organ. Here is work which I trust Professor Thiele will take up; he may perhaps have already done so. I must not intrude into the sphere of his labours.

As this paper will extend into, perhaps, two more parts of this journal, it becomes necessary to give with the first contribution a list of the species and the genera in which I provisionally place them. A key to the species of the subfamily I propose giving with the final portion, by which time I trust I shall be in possession of further material and be able to know more of species I have not attempted to name up to the present.

### *Description of the Subfamily Peltatinæ.*

Shells globose or globosely conoid, rather thin, some transparent, of few whorls.

*Animal*.—Foot divided and with the usual peripodial grooves. Mucous pore at extremity of foot, with a lobe above it; in some species this becomes much lengthened and horn-like. Both right and left shell-lobes present, either small or much lengthened or expanded to cover the shell. The generative organs present a male organ with a long flagellum and a free cæcum coiled up together, the cæcum contiguous to but distinct from the retractor muscle. Spermatheca a large bag on a strong stalk. The spermatophore elongate, of elaborate form, with many branched spines, varying in their shape in different species.



Radula and jaw as in the family.

South Africa, ranging northward; limits as yet unknown.

Compare description of *Ariophantinae*, Faun. Brit. Ind., Moll. p. 25.

### Description of the Genus *Peltatus*.

Shell with decussate or punctate sculpture adjacent to the protoconch, but not extending to the surface of the last whorls.

Animal with short lobe over the mucous gland at end of the foot and with short shell-lobes; in one or two species both are more elongate, in two there is a sharp bend in the penis-sheath.

The South-African species of *Zonitidae* which I have now seen appear to range themselves as follows:—

#### Species of *PELTATUS*.

Shells with decussate or punctate sculpture adjacent to the protoconch.

<i>aloicola</i> , M. & P., type.	Port Elizabeth.
—, var.	Grahamstown.
<i>trotteriana</i> , Bs.	Cape Colony.
<i>caledonensis</i> , sp. n.	" "
<i>capsula</i> , Bs.	" "
<i>natalensis</i> , Pfr.	Port Elizabeth.
<i>cotyledonis</i> , Bs.	Cape Colony.
<i>hudsoniae</i> , Bs.	" "
<i>arnotti</i> , Bs.	" "
<i>phytostylus</i> , Bs.	" "
<i>asthenes</i> , M. & P.	" "

Of the last four the animals have yet to be examined; the shell of *phytostylus* has a peculiar columellar margin, it will be interesting to see how far the animal differs from the species with which it is now included.

#### Species of *KERKOPHORUS*.

Sculpture the same throughout, apex smooth, some species polished and shiny. Animal with very long lobe at extremity of foot. Right shell-lobe large and broad, left also large.

<i>inunctus</i> , M. & P., type.	Alexandra Junction, Maritzburg.
<i>vitalis</i> , M. & P.	Port Shepstone.
<i>leucospira</i> , Pfr.	Tangaat.
<i>phædimus</i> , M. & P.	Maritzburg.
<i>melvilli</i> , sp. n.	Equeefia.
<i>corneus</i> , Pfr.	Maritzburg.

Shell-lobes lengthened and narrow.

<i>natalensis</i> , Krauss.	Port Elizabeth.
<i>ampliatus</i> , M. & P.	Maritzburg.
<i>poeppligi</i> , Mke.	Alexandra Junction, Maritzburg.

No. 15, sp. n. ?

Maritzburg.

Nos. 12 and 13, sp. n. ?

Equeefa, East London.

*cingulatus*.

Port Elizabeth.

*fuscicolor*, M. & P.

Harrismith.

This last appears to be a connecting-link with the next new genus.

#### New genus MICROKERKUS.

Lobe over mucous gland shorter ; shell-lobes much reduced in size.

*symmetricus*, Craven.

Pretoria.

*pondoensis*, sp. n.

Pondoland.

No. 72, sp. n. ?

Thabanchu, O.R.C.

#### New genus ?

*transvaalensis*, Craven.

Game Pass, Mooi River.

#### New genus ?

*pumilio*, M. & P.

Transvaal.

In the 'Annals and Magazine of Natural History,' February 1908, p. 131, I gave a description of a South-African land-shell which was then considered to be the same as *Helix* or *Helicarion hudsonie* of Benson, from three very badly preserved animals from Port Elizabeth. Sufficient was then seen of the external form and of the anatomy on which to create a new genus, *Peltatus*. The type shells are in Mr. John Ponsonby's collection.

I have now received and examined some animals of a species from another locality, some 60 miles to the eastward and inland, Grahamstown, also labelled *H. hudsonie*, collected by Mr. J. Farquhar, a resident. They are beautifully preserved, so I am able to extend and much correct errors in the original description.

The drawing of the generative organs (Pl. IV. fig. 1*b*) is far more correct than figs. 1*a* and 1*b* on pl. viii., 1908, made from specimens in a very decomposed state, and it serves to show the blunders one may fall into when working and drawing conclusions from inferior material. What was then assumed to be the retractor muscle of the male organ (*r.m.p.*), shown in dotted lines, is the free cæcum (*c.r.p.*), and should come out, the retractor of the penis was really lost. The spermatophore is in its right position in process of forming, and the spermatheca is correct ; of an ovoviviparous habit I was led to suppose there was not a sign. The vas deferens in fig. 1*a* does not join where indicated, and this and the oviduct (*ov.*) are all drawn out, and out of place owing to the soft state of the specimen.

Comparing the shells of these animals from Port Elizabeth and Grahamstown, they do not agree with the typical

examples of *H. hudsonia*, to which both have been assigned, nor are they quite similar to one another, though so exceedingly close; I should be sorry to separate them. *Helix hudsonia* having been referred to as the type of *Peltatus*, it becomes necessary to begin with the shells of that species originally collected by Benson, about 300 miles away to the westward, and refer to his description.

*Helix hudsonia*, Bs.

Ann. & Mag. Nat. Hist. ser. 3, vol. xiii. p. 493 (1864).

Original description :—

- “*H. testa minutissimae oblique perforata*, globoso-depressa, tenuissima, levigata, striatula, lineis minutissimis confertissimis spiralibus superne decussata, prope umbilicum polita, cornea, translucente, *prope suturam linea angusta rufescente ornata*; spira depresso-conoidea, sutura submarginata, apice obtuso; anfractibus  $3\frac{1}{2}$ , rapide accrescentibus, convexiusculis, ultimo lato, ad peripheriam rotundato, subtus convexo; apertura obliqua, globoso-lunata, marginibus subconniventibus; peristomate tenui, acuto; margine collumellari superne breviter reflexo, perforationem obtegenti.”
- “Diam. major  $12\frac{1}{2}$ , minor  $10\frac{1}{2}$ , axis 7 mm.

“A single full-grown specimen, with the young, was received from Mrs. J. F. Hudson, with *H. phytostylus*\*. The shell has a Vitrinoid appearance; but the sculpture, perforation, and suture, as well as the character of a portion of the animal remaining in the shell, prove it to be a *Helix*.”

Examining the sculpture of specimen dissected (no. 2022) from Grahamstown, and observed under high power, the protoconch appears to be quite smooth; it soon passes to a very beautiful and finely decussate surface, in parts punctate up to the second whorl, where it merges into very microscopic longitudinal striation.

Three specimens of *H. hudsonia* are in the Natural History Museum, presented by Mr. R. McAndrew in 1873; they are, I am inclined to think, the type shells from which Benson made his description, and alluded to as one full-grown specimen and one young, because the coloured suture he mentions is very conspicuous, most probably due to some colouring-matter derived from the soil and not a true character. In these type shells it was interesting to find in the apical part of the shell the decussate surface mentioned above in the Grahamstown shell.

\* Colesberg, 235 miles west of Natal, and near Riversdale, Swellendam, about 100 miles east of Cape Town.

I also compared the six specimens of this species in the McAndrew collection, Cambridge, kindly sent to me by Mr. L. Doncaster, to whom my best thanks are due. Four of these show ruddiness in the suture. The perforation is exceedingly minute, as Benson describes. Looking at the so-called *hudsonia* sent me by Ponsonby and Burnup from Port Elizabeth and Grahamstown, perforation is not apparent; the shells, too, are darker and far more solid in structure than the typical form. I am therefore disposed to consider that true *H. hudsonia* is confined to the area around Swellendam. The four specimens under this name in the Natural History Museum collection from Algoa Bay show minute perforation, but differ from the typical shells in being larger,  $13\frac{1}{2}$  mm. in major diameter.

Only a comparison of the animals of *hudsonia* from the original habitat, with those I have mentioned from the country further east, can conclusively solve what degree of difference there may be in the animals; judging from those I have dissected from the western side, it will not be very great.

*Peltatus aloicola*, M. & P., var. (Pl. IV. figs. 1, 1 a, 1 b.)

*Locality.* Grahamstown (*J. Farquhar*).

The animal: the foot is indistinctly divided.

The lobe over the mucous gland is quite small (Pl. IV. fig. 1 a).

Both right and left shell-lobes are small and narrow (Pl. IV. figs. 1 & 1 a).

The visceral sac is much mottled with a ground-colour of pale ochraceous, but milky white is the predominant colour. There is a narrow border of black on the mantle-edge in front: the branchial sac up to the kidney (*k*) is broadly streaked with white; this organ is bordered by a narrow bar of black, sharply edged with white, thence to the apex there are large blotchings of white with a few small spots of same colour mixed with them. I have examined some eight specimens; the bar of black is a conspicuous feature, showing through the shell.

*Generative organs* (Pl. IV. fig. 1 b).—The penis-sheath is doubled on itself in close S-form, the retractor muscle is given off just above it; the epiphallus is fairly long, with a short caecum-like accessory gland about midway. Flagellum short and pointed. Spermatheca globose on a thick stalk.

Radula formula: 46 . 2 . 14 . 1 . 14 . 2 . 46, or 62 . 1 . 62.

Jaw with a central projection.



The shell of *aloicola*, var., under high powers, is smooth on the last whorls, with the faintest indication of irregular striae lines running longitudinally; near the protoconch the surface is decussate or punctate.

Recently (November 1911) I have seen quite a number of shells of this species from the Ponsonby collection, fine specimens and fully grown, whereas those sent me, preserved in spirit, were quite young shells—the major diameters respectively being 11.5 and 16 mm. As is, I fear, generally the case, the finest shells find their way into the cabinet, the finest animals are thrown away, at one time they were never saved at all.

From Port Elizabeth has been described as a var. of *Hudsonia* another species, *aloicola*, M. & P. I have compared the type shells of this with *hudsonia*, Bz., type of *Peltatus*, originally described in 1908, and I cannot see any difference to seize on. Fortunately one contained a dried-up animal, and this clears the position up, for after a lengthy soaking I am able to give the following description:—

*Peltatus aloicolor*, M. & P.

Port Elizabeth.

*Animal*.—Visceral sac, ground-colour dark brown, with a very large amount of white, broadly distributed, and extending to the apex with a few white spots: *vide* description of the Grahamstown species. The right shell-lobe and the extremity of the foot had been unfortunately destroyed, but the left shell-lobe was intact, small, and triangular, somewhat similar to fig. 1 *a*, Pl. IV.; I therefore infer the right shell-lobe is small, as in fig. 1 *a* of the same Plate. There is a sharp bend in the shaft of the male organ, and the generative organs correspond to those of that Grahamstown species: a well-developed spermatophore is also present. The two specimens are very much alike and may both be taken as typical of the genus *Peltatus*. More observations of both in a living state would be conclusive and are required. The radula was extracted complete; it has a great number of teeth in the row, the marginals becoming very minute and evenly bicuspid. I counted the row to be 90 . 3 . 13 . 1 . 13 . 3 . 90, or 106 . 1 . 106. Jaw with no central projection as in pl. viii. fig. 1 *c*, Ann. & Mag. Nat. Hist. ser. 8, vol. i.

With regard to the sharp S-like bend in the shaft of the male organ which occurs in *P. aloicola*, var. (Pl. IV. fig. 1 *b*), *caledonensis* (Pl. V. figs. 1, 1 *a*, B), and *trotteriana* (Pl. VI. fig. 1 *c*), this is met with in other species, varying in

degree, and is indicated in a different way or absent as in *natalensis* (Pl. VI. fig. 2) and in a yet unnamed species no. 15 to be described later on.

For some time I was at a loss to account for the presence and meaning of certain very defined lines on the surface of the main shaft of the penis when making drawings of the genitalia: see *symmetricus* and *melvilli*, figured in the next part. It would appear that this folding becomes so buried in the muscular tissue which holds the folds together, as a last phase, that it is concealed altogether. In the other direction the folding is so slight that only an indication of it remains, as in no. 15; in *capsula* and nos. 12 and 13 (also undescribed species) it is altogether absent.

*Peltatus caledonensis*, sp. n. (Pl. II. figs. 1, 1 a.)

*Locality.* Houn Hoek, Caledon Div., Cape Colony (Connolly).

Shell conoid, no perforation; sculpture decussate near apex, rest beautifully fine and regular, microscopical longitudinal striation, crossed by the lines of growth; colour dull ochraceous or straw; spire subconoid; suture impressed; whorls  $4\frac{1}{2}$ ; aperture oblique, rotundate, curve near circular on the thin peristome; columellar margin vertical, not thickened.

Size: major diameter 12.75, minor 11.0; alt. axis 6 mm.

This shell is remarkably like that of *capsula*, Bs., from Simonstown in the sculpture, but is much higher in the spire, also very close in form to typical *hudsoniae*, Bs.

Connolly, writing to Mr. J. Ponsonby, says: "No. 60, *Peltatus* sp. 2 in spirit: these will, I hope, be of interest, for Colonel Godwin-Austen will at once settle whether they are *Peltatus* or *Helicarion*, and whether or not they are the same as the shell from Simonstown, one of those already in your hands unnamed [*capsula*, Bs.], and also whether both the Houn Hoek and Simonstown shells = *Peltatus hudsoniae*, as Burnup thinks probable."

*Animal.*—Extremity of the foot truncate (Pl. V. fig. 1 c), the lobe above elongated. Foot divided. Right shell-lobe long and narrow (Pl. II. fig. 1 a), much longer than in what has been called *P. hudsoniae*, var. = *alvicola*, var., from Grahamstown. The left shell-lobe is triangular and small (Pl. II. fig. 1). Visceral sac (same figure) is closely mottled black, and forming thus two parallel bands, the lower the most distinct near the kidney, the upper one arranged in zigzags. The apical whorls black, with large white spots.

There is here a similarity with the species from Simonstown identified as *capsula*, Bs., but they are not the same. The animal compared also side by side with *aloicola*, var., is at once seen to be different in the distribution of colour and consequently of pattern.

In the generative organs (Pl. V. figs. 1, 1 a) the penis is closely bent on itself in S-shape (B) and held together by muscular tissue; close above this bend the retractor muscle is given off, and then comes a short straight accessory gland or caecum on the epiphallus, which is not very long, to where the vas deferens joins; here is a fairly long flagellum. The spermatheca is a large globular sac on the head of a strong and lengthened duct. There is remarkable similarity here with the generative organs of *aloicola*, var., of Grahamstown, and this extends to the spermatophore. I was not fortunate enough to find this in a perfect state, but enough pieces were found in the spermatheca to show the form of the spines. They were found to be different from those of species hitherto examined from S. Africa. They are beautifully branched, and each branch terminates in a peculiar flat bifid end (Pl. IV. fig. 3). It is interesting to note that in *aloicola*, var., similar pointed spines occur; the contents of the spermatheca in three specimens were examined, and in one two or three such points were discovered, all the rest had been absorbed. The jaw (Pl. V. fig. 1 b) has a central projection on a concave edge. The radula (Pl. V. fig. 1 c) formula is  $58 \cdot 2 \cdot 9 \cdot 1 \cdot 9 \cdot 2 \cdot 58$ , or  $69 \cdot 1 \cdot 69$ . The admedian are all bicuspid, nearly equally so, becoming more even as they approach the margin. The last three on the edge are very small (Pl. V. fig. 1 d) and three- to four-cuspid.

This is a true *Peltatus*, its anatomy as regards the genitalia being similar in every respect to the typical species. It differs, however, in the shell-sculpture and in the radula and general colour of the animal.

### *Peltatus capsula*, Bs.

Ann. & Mag. Nat. Hist. ser. 3, vol. xiii. p. 492 (1864).

#### *Locality.* Simonstown.

Captain Connolly writes, under date 12th January, 1910:—"With no. 31, ? *Helicarion* ? n. sp., loc. Simonstown, probably a *Peltatus*, and Burnup thinks it may be merely a var. of *hudsonice*. The live animal is palish grey, with a beautifully spotted mantle and long wavy horn on its tail." The shell is not at all like *P. hudsonice*, of which the type has been preserved both in the B. M. and Cambridge

Museum. The apical whorls are sculptured with fine regular longitudinal striation, which merges into finer striation on the rest of the shell.

The animal in spirit is very pale in coloration, with the overhanging long lobe on the extremity of the foot tipped black. Both the right and left shell-lobes are long and narrow. Foot long, narrow, and divided.

The wall of the branchial sac is, as Connolly describes it, beautifully streaked and mottled with black and pure milky white, the dark spots larger over the kidney and heart. Towards the apex the sutural line is bordered black, with a few white spots.

The generative organs (Pl. VII. fig. 2) are in every respect like those of *Peltatus*, with the exception of the sheath of the penis being straight, not S-shape; there is a vestibule; the accessory gland is short and thick, the flagellum the same. The spermatheca on a thick stalk, the sac much enlarged and elongately pear-shaped. This sac contained a spermatophore (Pl. VII. figs. 2a, 2b) in a most perfect stage of development. On the flume of this are some twenty-five many-branched spines closely set together on one side only; although in fig. 2a they appear alternately on either side, it is a twisting of the flume which gives this appearance. The branches do not terminate in the bifid manner as is usually the case, but splay out and become flat-topped.

*Peltatus cotyledonis*, Bs.

*Locality.* Koumetje, south of Cape Colony (*M. Connolly*).

Shell strongly decussate next protoconch when examined under high power.

Animal with foot dark-coloured below, pale above, with lobe over mucous gland. A tongue-shaped right shell-lobe, dark tipped and finely pointed, and a small left shell-lobe given off from a broad base; left dorsal lobe divided into two narrow parts. The anterior part of the visceral sac plain, towards the apex dark, white at apex.

The radula formula is 50.3.9.1.9.3.50, or 62.1.62. Form of the teeth as in all this genus—the marginals bicuspid, inner cusp slightly the longest, the outermost teeth more evenly bicuspid. Jaw with a central projection.

Captain Connolly tells me “the live animal is of a peculiarly orange-brown colour, almost pure orange, especially the under part.” Ponsonby gives me this extract from Connolly:—“I am pretty certain that *Zingis afra* and *pinguis* do not have horns on their tails, while *thermarum* and *cotyledonis* do.”



It was unfortunate to find the spirit all evaporated in this tube, so that the animals were dried up and the genitalia could not be made out after the soaking it was subjected to; but enough was seen to place it in its generic position.

*Peltatus trotteriana*, Bs. (Pl. V. figs. 2, 2 a.)

*Locality* not given on tube.

First specimen dissected: animal brown, as also the ground-colour of the visceral sac, but very little of the ground-colour is to be seen; the greater part of the surface on the upper side is covered with large isolated patches of milky white, while on the lower side the same colour occurs as small spotting. A black band margins the liver, another, less distinct, the rectum.

The right shell-lobe is short and triangular, the left shell-lobe is very small. The lobe above the mucous pore is fairly large (Pl. V. fig. 2 a).

Teeth of the radula are similar to those of *Microkerkus pondoensis*; marginals evenly bicuspid.

Radula formula: 65 . 2 . 11 . 1 . 11 . 2 . 65, or 78 . 1 . 78.

Jaw (Pl. V. fig. 2) with central projection.

*Peltatus trotteriana*, Bs. (Pl. VI. figs. 1-1 c.)

*Locality*. Cape Province (Capt. M. Connolly); two specimens, no. 78.

Shell globose conoid, imperforate; sculpture smooth, crossed by a few lines of growth, shows indistinct decussation near protoconch, which is smooth; colour pale ochraceous, more intense at the apex; spire high, conical, apex blunt and rounded; suture well impressed; whorls 4, rapidly increasing, the last very ample, very convex; aperture lunate, higher than breadth, subvertical; columellar margin weak, not reflected.

Size: major diameter 13.5, minor 12.25; alt. axis 8.5 mm.

*Animal* (Pl. VI. fig. 1, 1 a).—Visceral sac plain, no spotting; a band of pale brown over kidney, in one specimen another much paler next the rectum at the apex dark brown, with some milky white extending over half the upper surface. The right shell-lobe (Pl. VI. fig. 1) very small, the left (fig. 1 a) quite minute, just a remnant. Foot short, very distinctly divided, lobe over the mucous gland very small.

The genitalia (Pl. VI. figs. 1 b, 1 c) were not at the fullest stage of maturity, yet sufficiently so to show all important parts and that they are of the type of the subfamily. The penis just below the retractor muscle is closely folded into

S-shape (*b*); the epiphallus is long, and about midway is a short cæcum. At the junction of the vas deferens there is a rather short thick flagellum, which contained an immature spermatophore. The spermatheca is globose on a thin stalk.

Radula formula: 58 . 2 . 12 . 1 . 12 . 2 . 58, or 72 . 1 . 72.

*Helix natalensis*, Pfr.

Symbolæ, 1846, iii. p. 65.

Original description :—

“*T. imperforata*, subglobosa, tenuis, lævigata, subdiaphana, corneo-albida, lineis fuscis irregulariter radiata, *spira elevatiuseula*, obtusa; anfr. 4, vix convexiuseuli, ultimus inflatus; columella subverticalis, filiformis, profunde intrans; apertura lunato-rotundata, intus fulva, nitida, perist. simplex, acutum.

“Diam. 12, alt. 9 mill.

“Port Natal (*Menke*).

“This species is figured by Küster (Neues Conchyl.-Cabinet, t. xxix. figs. 30, 32).”

In the Nat. Hist. Museum are four specimens under this name (precise locality not given, only S. Africa), presented by J. H. Ponsonby in 1888. There is this note in pencil: “Compared by Dohrn with Pfeiffer’s type.” The largest measures 15 mm. in major diameter, alt. axis  $8\frac{1}{2}$ . It shows narrow transverse bands of colour alternating pale and dark. The apical whorls are strongly decussate under high power. Its form is well represented in Küster’s figures, and the striping even indicated.

*Peltatus natalensis*, Pfr. (Pl. III. figs. 2, 2*a*;  
Pl. VI. fig. 2.)

*Locality.* Port Elizabeth.

The animal (Pl. III. figs. 2, 2*a*) is pale-coloured. The foot has a small overhanging lobe above the mucous pore, no doubt elevated when alive; the oblique grooves on the side of the foot running from the peripodial grooves to the dorsal line of the foot are close together, the margin is rather broad. The right shell-lobe (Pl. III. fig. 2) is long and narrow on the side of the right dorsal lobe. The left shell-lobe (Pl. III. fig. 2*a*) is also narrow, but very short. The left dorsal lobe is in two parts, the posterior being long and narrow. The visceral sac next the mantle-margin is closely speckled with pure white, and the same colour predominates along the line of the rectum up to the kidney and, with more or less mottling, continues to the very apex. At the generative aperture (Pl. VI. fig. 2) there is an ample bulbous vestibule,

which, on being opened to view, did not show inside the folded walls as in *Kerkophorus inunctus*, M. & P., but the sac contained a good deal of extraneous loose matter, which under a high power had all the appearance of being the broken-down walls of the vestibule, the result of decomposition, the specimen not being in the best state of preservation.

The male organ has a short flagellum, a cæcum, and an accessory gland near the retractor muscle, which is long. The spermatheca is a globose sac on a thick stalk-like duct.

In a row of the radula the teeth are arranged as follows:—

$$56 \cdot 1 \cdot 10 \cdot 1 \cdot 10 \cdot 1 \cdot 56 = 67 \cdot 1 \cdot 67.$$

The central and admedian as in *aloicola*, M. & P., var., and other Cape species. The transition tooth similar, but on a narrower basal plate; it is succeeded by some three teeth, the outer cusp of which is below the terminal point, all the succeeding laterals being unevenly bicuspid and diminishing gradually to the margin, where they become very minute.

*Peltatus phytostylus*, Bs.

Ann. & Mag. Nat. Hist. ser. 3, vol. xiii. p. 492 (1864).

*Original locality.* Colesberg.

*Peltatus arnotti*, Bs.

Ann. & Mag. Nat. Hist. ser. 3, vol. xiii. p. 491 (1864).

*Original locality.* Colesberg.

The animals of these last two species have not yet been seen by me.

## EXPLANATION OF THE PLATES.

### PLATE I.

*Kerkophorus corneus*?, Pfr. Maritzburg.

*Fig. 1.* Animal, viewed from the right side.  $\times 1\cdot5$ .

*Fig. 1 a.* Ditto, left side.  $\times 1\cdot5$ .

*Fig. 1 b.* The visceral sac, showing left shell-lobe, the region of the branchial sac, kidney, &c.  $\times 4\cdot5$ .

*Microkerkus symmetricus*, Craven. Pretoria.

*Fig. 2.* Animal, viewed from the right side.  $\times 1\cdot5$ .

*Fig. 2 a.* Ditto, left side.  $\times 1\cdot5$ .

### PLATE II.

*Peltatus caledonensis*, sp. n. Cape Colony.

*Fig. 1.* Animal, anterior part viewed from the left side, to show the

mantle-edge and small left shell-lobe, with the visceral sac; shell removed.  $\times 4\cdot5$ .

*Fig. 1 a.* Animal, viewed from the right side, showing right shell-lobe and right dorsal lobe, and spotting on the visceral sac.  $\times 4\cdot5$ .

No. 15. *Kerkophorus*, sp. n.?, undetermined. Maritzburg.

*Fig. 2.* Animal, shell removed, viewed from the right side, shell- and dorsal lobes and visceral sac.  $\times 4\cdot5$ .

*Fig. 2 a.* Ditto, from the left side.  $\times 4\cdot5$ . Equeefa.

*Fig. 2 b.* The extremity of the foot.  $\times 4\cdot5$ .

No. 3379. *Kerkophorus*, sp. n.?, undetermined. Pinetown.

*Fig. 3.* Animal, viewed from the right side.  $\times 1\cdot5$ .

*Fig. 3 a.* Anterior part of animal, viewed from the left side.  $\times 4\cdot5$ .

#### PLATE III.

*Kerkophorus inunctus*, M. & P. Alexandra Park, Natal.

*Fig. 1.* Animal, as seen from the right side.  $\times 1\cdot5$ .

*Fig. 1 a.* Ditto, anterior part from the left side, showing the left dorsal and left shell-lobe.  $\times 1\cdot5$ .

*Peltatus natalensis*, Pfr. Port Elizabeth.

*Fig. 2.* Animal, as seen from the right side.  $\times 1\cdot5$ .

*Fig. 2 a.* Ditto, left side.  $\times 1\cdot5$ .

*Fig. 3.* Extremity of foot of *Kerkophorus vitalis*, M. & P.  $\times 4\cdot5$ . Natal.

*Fig. 4.* Ditto of *Microkerkus symmetricus*, Craven.  $\times 8$ . Pretoria.

#### PLATE IV.

*Peltatus aloicola*, M. & P., var. Grahamstown.

*Fig. 1.* Part of the animal, seen from the right side.  $\times 4\cdot5$ .

*Fig. 1 a.* Ditto, from the left side, to show the right and left shell-lobes.  $\times 4\cdot5$ .

*Fig. 1 b.* The generative organs.  $\times 8$ .

*Microkerkus pondoensis*, sp. n. Kentani, near Pondoland.

*Fig. 2.* The generative organs.  $\times 8$ .

*Fig. 2 a.* Teeth of the radula at different parts of the row.  $\times 363$ .

*Peltatus caledonensis*, sp. n. Cape Colony.

*Fig. 3.* A portion of the spermatophore.  $\times 30$ .

#### PLATE V.

*Peltatus caledonensis*, sp. n. Cape Colony.

*Fig. 1.* Part of the generative organs.  $\times 4\cdot5$ .

*Fig. 1 a.* Ditto of another specimen, more perfect.  $\times 4\cdot5$ .

*Fig. 1 b.* Jaw.  $\times 12$ .

*Fig. 1 c.* Teeth of the radula, nos. 6 to 16.  $\times 363$ .

*Fig. 1 d.* Outermost teeth.  $\times 363$ .

*Fig. 1 e.* Extremity of the foot.  $\times 4\cdot5$ .



*Peltatus trotteriana*, Bs. Cape Province.

Fig. 2. Jaw.  $\times 12$ .

Fig. 2 a. Extremity of the foot.  $\times 4\cdot5$ .

*Kerkophorus phædimus*, M. & P. Maritzburg.

Fig. 3. Part of the generative organs.  $\times 8$ .

PLATE VI.

*Peltatus trotteriana*, Bs.

Fig. 1. Animal with shell removed, seen from the right side.  $\times 4\cdot5$ .

Fig. 1 a. The same, from left side.  $\times 4\cdot5$ .

Fig. 1 b. Portion of the generative organs.  $\times 4\cdot5$ .

Fig. 1 c. The male organ.  $\times 8$ .

*Peltatus natalensis*, Pfr. Port Elizabeth.

Fig. 2. The generative organs.  $\times 4\cdot5$ .

PLATE VII.

*Kerkophorus melvilli*, sp. n. Equeefa.

Fig. 1. Portion of a spermatophore.  $\times 12$ .

Fig. 1 a. Three central teeth of the radula.  $\times 368$ .

Fig. 1 b. Nos. 12 to 15, transition teeth.  $\times 368$ .

Fig. 1 c. Lateral teeth about 32 from the extreme margin.

Fig. 1 d. 8 teeth nearer the margin.

*Peltatus capsula*, Bs. Simonstown.

Fig. 2. Generative organs.  $\times 4\cdot5$ .

Fig. 2 a. A spermatophore complete.  $\times 18$ .

Fig. 2 b. A portion of same, A-B.  $\times 24$ .

XIV.—*Descriptions and Records of Bees*.—XLI.

By T. D. A. COCKERELL, University of Colorado.

*Trigona cassiæ*, Cockerell.

Additional workers collected by Mr. Turner at Mackay, Queensland, show that usually the scutellum has a broad interrupted cream-coloured band and a spot of the same colour on each axilla. The scutellar band may be only notched, not interrupted, and the axillar spots may be very minute. The new specimens are from flowers of *Cassia*, except one from *Eucalyptus*.

*Trigona carbonaria*, Smith.

When describing *T. cassiæ*, I suggested that it was perhaps the species recorded by Friese from Mackay as *T. car-*

*bonaria*. However, I now have before me two workers of *carbonaria*, collected by Mr. Turner at Mackay, April 1900, at flowers of *Xanthorrhæa*, and September 1894. The latter bears the number 318, which was also used for male *cassia*.

*Megachile lanata* (Fabricius).

Mr. W. Büthn sends me a female which he obtained near Gordon Town, Jamaica, 1911. The species is East Indian, and has doubtless been introduced, as it has in Trinidad. Fox has described it from Kingston, Jamaica, as *Megachile martindalei*. In Turton's edition of the 'Systema Naturæ,' *Apis lanata* is said to occur in the "South American Islands."

*Centris lepeletieri*, sp. n.

*Centris hæmorrhoidalis*, Lepeletier, Hist. Nat. Ins. Hyménop. ii. p. 155. (S. Domingo.)

The Fabrician *C. hæmorrhoidalis* was briefly described from the West Indies, no special locality being cited. I believe the name may properly be applied to the Jamaican species, which differs from that of S. Domingo by having the first four abdominal segments and the base of the fifth blue in the male, and in the female the first four blue, the apical margin of the fourth reddish. In the face-markings *C. lepeletieri* resembles *C. elegans*, Sm., from St. Vincent, rather than the Jamaica insect. I have a pair of *C. hæmorrhoidalis* collected by Mr. Büthn near Gordon Town, Jamaica, from which I note some characters not brought out by the published descriptions.

*Centris hæmorrhoidalis* (Fabricius).

♂.—Anterior tibiæ with a longitudinal cream-coloured stripe; posterior long hairs on hind basitarsus tipped with white.

♀.—Clypeus black; very sparsely punctured, with a small round cream-coloured spot near each anterior corner; lateral face-marks reduced to a stripe along each orbital margin; a small triangular supra-clypeal mark; anterior tibiæ with a short oblique white stripe; second abdominal segment without the lateral light spots seen in the male; hind basitarsal hairs not tipped with white.

*Hyleoides concinna* (Fabricius).

Sydney and Cook's River, Australia (*Froggatt*).

*Pachyprosopis angophoræ*, sp. n.

♂.—Length about 6 mm.

Black, wholly without metallic lustre; legs and scape bright chrome-yellow; flagellum yellow suffused with ferruginous, the last four joints black, and a blackish suffusion extending down the upper side of four more; scape thick; clypeus and supraclypeal area brilliantly shining, sparsely punctured; mouth-parts prosopiform, maxillary palpi quite long; head as in *Euryglossa*, not specially enlarged; front densely punctured; mesothorax and scutellum finely and distinctly, but less densely, punctured; a beaded furrow runs along hind margin of postscutellum; tegulae brownish piecous, with a yellow spot. Wings clear, with dark reddish-brown nervures and stigma; venation as usual in the genus; femora broad; hind tibiae robust; hind basitarsus curved, thickened at base, with an inward projection, beyond this concave on the inner side, with a few curved erect spines. Abdomen broad, dullish, with a subsericeous lustre, the surface under the microscope seen to be covered as densely as possible with regular, well-defined, transversely oval punctures; the mesothorax between the punctures is microscopically tessellate.

*Hab.* Sydney, New South Wales, at flowers of the Myrtaceous *Angophora*, December 1, 1910 (*W. W. Froggatt*, 110). Two specimens.

Very distinct from all other described *Pachyprosopis* by the wholly black body.

*Pachyprosopis flavicauda*, sp. n.

♀.—Length 5 mm. or slightly over.

Black, with the abdomen reddish yellow at apex and partly at sides; labrum, and mandibles except at apex, pale red; face and front brilliantly shining; clypeus with sparse distinct punctures; front microscopically reticulate, with very sparse minute punctures; clypeus low and broad, the supraclypeal area very large; head of ordinary size, as in *Euryglossa*; antennae ferruginous beneath, the flagellum thick; mesothorax microscopically reticulated, with sparse weak punctures; abdomen with microscopical sculpture as in *P. angophoræ*; tegulae light rufo-testaceous; legs pale ferruginous, with the femora mainly dark, at least behind, and the tibiae also with large dark marks. Wings clear, nervures and stigma sepia. Abdomen with the last segment, the penultimate (except a black band at extreme base, broadly lobed in middle, not reaching sides), and the

posterior apical corners of the second to fourth reddish orange or orange ferruginous.

*Hab.* Sydney, New South Wales, at flowers of *Angophora*, December 1, 1910 (*W. W. Froggatt*, 111).

Known from all the other *Pachyprosopis* by the black abdomen with light apex. On account of the small size, and quite different sculpture of head and thorax, I cannot regard this as the female of *P. angophoræ*. Two specimens were sent.

*Pachyprosopis humeralis*, sp. n.

♂.—Length about  $4\frac{1}{3}$  mm.

Black, the abdomen very dark brown, with yellow bands at the extreme bases of the second to fourth segments, or only on the second; face below antennæ, labrum, mandibles (except tips), cheeks (ending some distance below top of eye), scape and frontal mark, all brilliant chrome-yellow; the frontal mark, connecting with the supraclypeal, is large and circular or subquadrate; the yellow lateral marks extend above the level of the antennæ very broadly, with a further linear extension along the orbit, the whole like a hand with the index-finger pointed; flagellum dull yellowish beneath; third antennal joint extremely short, a mere ring, fourth twice as broad as long; facial foveæ linear, sharply pointed above; upper part of head and thorax dull, rather coarsely microscopically tessellate, with scattered punctures; the broad base of metathorax more shining, with a microscopic cancellation; upper part of thorax all black, except broad anterior corners of mesothorax, which are yellow, the yellow ending in a sharp point over the tegulæ; sides of prothorax, tubercles (except a dark dot), anterior part of pleura, a small stripe invading mesopleura, and under side of thorax all yellow; legs yellow, the hind tibiæ with a dark stripe; hind legs quite normal; tegulæ pale testaceous. Wings clear, nervures piceous; first r. n. entering apical corner of first s.m.; second s.m. narrow, its upper apical angle variably produced, but always essentially in the *Pachyprosopis* manner; stigma large, sepia-brown. Abdomen broad, the apex ferruginous; venter yellow.

*Hab.* Sydney, New South Wales, three at flowers of *Angophora*, Dec. 1, 1910 (*W. W. Froggatt*, 112 = type, and 115 in part).

Quite unlike all other *Pachyprosopis* by its yellow markings, in which it resembles one of the groups of *Euryglossa*. The head also is formed as in *Euryglossa*. The abdomen has a minute transverse tessellation, but no distinct punctures.



*Euryglossa mutica*, sp. n.

♂.—Looks exactly like *Pachyprosopis humeralis*, but on closer inspection seen to differ as follows: nervures paler, second s.m. quadrate, its upper apical angle about a right angle; no yellow frontal mark; yellow going hardly half-way up cheeks; facial fovea shorter; mesothorax entirely black; thorax rather more shining; sides of prothorax, with tubercles, and anterior coxæ, yellow, but thorax otherwise black beneath. The third antennal joint is a mere ring, as in *P. humeralis*.

*Hab.* Sydney, New South Wales, one at flowers of *Angophora*, Dec. 1, 1910 (W. W. Froggatt, 115, in part).

What is the real relationship of *E. mutica* to *P. humeralis*? On the venation, they go in different genera, yet they are so closely allied that I was at first convinced that they were forms of one species. I do not yet consider it satisfactorily demonstrated that *E. mutica* is not a "mutation" of the *Pachyprosopis*, but in view of the various differences I describe them as distinct. The male of *E. calliopsella*, which Professor Froggatt took on the same day as *E. mutica*, is very similar in coloration, and no doubt closely allied; but it is much larger, and has a much longer second submarginal cell, which receives both recurrent nervures. The genus *Pachyprosopis* variously grades into *Euryglossa* and becomes hard to define. It could be restricted to the species with large heads, but this seems unsatisfactory.

*Euryglossa aurantifera*, sp. n.

♀.—Length about  $9\frac{1}{2}$  mm.

Black, with bright chrome-yellow markings on head and thorax; head broad, inner orbits nearly parallel; clypeus (except a pair of small black marks), semicircular clypeal area, and broad supraclypeal marks bright yellow, the latter filling space between clypeus and eyes and extending broadly upwards, ending near level of upper margin of antennal sockets, the highest point nearly halfway between antennæ and eyes; mandibles and the shining labrum wholly dark; front and vertex dull, the latter with black hair; mesothorax dull, with black hair, its anterior lateral corners with a large yellow patch; tubercles broadly yellow, but pleura wholly black; scutellum, postscutellum, and axillæ yellow, not shining; area of metathorax dull, without any evident sculpture; tegulæ black. Wings clear, with piceous nervures and stigma; second s.m. long, receiving the recurrent nervures a considerable distance from its base and apex;

second t.-c. straight. Legs entirely dark, with thin pale hair. Abdomen flattened, dull at base, more shining apically, with black hair. Under the microscope the sculpture of the thorax above is seen to consist of a very minute network, the meshes elongate; there are no punctures.

*Hab.* Sydney, New South Wales, Nov. 29, 1910 (*W. W. Froggatt*, 132).

Unfortunately the specimen was broken in transit and the antennæ lost.

Very close to *E. geminata*, Ckll., but differing by the absence of yellow spots on the abdomen, the darker nervures, and the much longer second submarginal cell. Also related to *E. quadrimaculata*, Smith, which has four yellow spots on the abdomen. These insects closely resemble species of *Prosopis*.

*Meroglossa (sulcifrons* subsp. ?) *persulcata*, sp. n.

♂.—Length about 9 mm.

Black, with the face deeply sulcate on each side of the clypeus, the middle of which is strongly elevated; face-marks creamy white; thoracic markings (consisting of tubercles), a large rounded patch behind, scutellum and postscutellum (but not axillæ) bright chrome-yellow; light marks of face consisting of elevated part of clypeus, a large triangular patch on each side, a supraclypeal dot, and lateral face-marks, ending in a broad truncation a little below middle of front; there is a dark shade on each lateral mark next to the eye; malar space, labrum, and cheeks black; tongue slender and pointed; maxillary palpi very long; scape black; flagellum dark red beneath, the last joint pointed; front depressed, smooth and shining above antennæ, but beyond this punctate; mesothorax shining, strongly punctured; basal area of metathorax longitudinally finely ridged or striate; legs black, with some of the hair shining silvery; tegulæ piceous, with a yellow dot. Wings dusky, nervures and stigma dark brown, second s.m. receiving both recurrent nervures. Abdomen shining, conspicuously punctured, punctures on first segment conspicuously finer than those on second.

*Hab.* Southern Queensland (*Froggatt*, 36). Certainly very near to *Meroglossa sulcifrons* (*Prosopis sulcifrons*, Smith), but the lateral face-marks of *sulcifrons* are much more reduced. The large white area on clypeus in *persulcata* is long and narrow, a truncated cone, not "bell-shaped"; the wings of *persulcata* are distinctly dusky, not "hyaline . . . their extreme apex slightly clouded." It is possible, however, that *persulcata* is a race of *sulcifrons*.

*Prosopis nubilosella mediosticta*, subsp. n.

♀.—Larger, length about 8 mm.

Wings strongly infuscated; second s.m. not especially long; clypeus wholly black; a triangular creamy-white mark on upper part of supraclypeal area; inconspicuous linear marks at sides of front as in *nubilosella*; tubercles broadly, mesothorax and scutellum bright orange, the surface of mesothorax and scutellum dull. Abdomen pure black, finely but distinctly punctured. Head short and broad compared with *nubilosa* and its immediate allies.

*Hab.* Butany, New South Wales, Nov. 10, 1891 (*Froggatt*, 221).

This is perhaps a distinct species, but it is in any event very close to *P. nubilosella*. The legs carry three asclepiad pollen-masses.

*Prosopis quadriceps*, Smith, var. *a*.

♀.—Large (about 8 mm. long).

Legs all dark except the broadly yellow base of hind tibiae; lateral face-marks lobed above, the whole shape much like that of a snail crawling, with obtuse foot and no tentacles.

*Hab.* Kenthurst, New South Wales, Oct. 9, 1903 (*Froggatt*, 27).

I do not give this a special name, as it is probably no more than an individual variation.

*Prosopis chrysognatha*, Cockerell.

Described from Melbourne. A male (*Froggatt*, 30) is labelled "A. decur., Nest," March 10, 1893. It differs from the type in having the first r. n. meeting first t.-c. We are doubtless to understand that it nests in *Acacia decurrens*.

*Prosopis alcyonea*, Erichs.

Both sexes from National Park, New South Wales, Dec. 10, 1909 (*T. McC.*; sent by *Froggatt*).

*Prosopis impressifrons*, Smith.

Described from "New Holland." A male before me is from Kenthurst, New South Wales, October 1903 (*Froggatt*, 32). The second to fourth ventral segments of abdomen have a rather inconspicuous tubercle on each side. The scape is extremely thick.

*Prosopis desponsa*, Smith.

Described from "New Holland." A female before me is from Heathcote, New South Wales, June 28, 1894 (*Froggatt*, 21). Smith says, "this is probably the female of *P. impressifrons*," and I believe this suggestion is correct.

*Prosopis morosa*, Smith.

Described from "Australia." A female before me is from Como, New South Wales, Nov. 1, 1902 (*W. W. Froggatt*, 31).

*Prosopis perplexa*, Smith.

Described from "New Holland." Mr. Froggatt has taken females at Mosman's Bay (Oct. 4, 1892) and Hornsby (Feb. 22, 1894), New South Wales. The venation varies, the first r. n. joining the first t.-c. or entering the first s.m.

*Prosopis elegans*, Smith.

Kenthurst, New South Wales. Feb. 1904 (*Gallard*). A male of var. *sydneyana* (Ckll.) is from Wellington, N.S.W., 1896 (*Froggatt*).

*Prosopis aureomaculata*, Cockerell (? = race of *nubilosa*, Sm.).

Additional specimens (males) collected by Mr. Turner at Mackay, Queensland, in May, show that *subnubilosa*, Ckll., completely intergrades, and must be regarded only as a variation. The range of *P. aureomaculata* is greatly extended by males from Como, N.S.W., Nov. 1, 1902 (*Froggatt*), and females from Kenthurst, N.S.W. (*Gallard*), and Sydney, N.S.W., at *Angophora*, Dec. 1 (*Froggatt*).

*Prosopis amicula*, Smith.

Described from Champion Bay. Females were collected by Mr. Froggatt at Wellington, N.S.W., 1891; and Sydney, at flowers of *Angophora*, Dec. 1, 1910.

*Prosopis flavojugata*, sp. n.

♀.—Length about  $5\frac{1}{2}$  mm.

Black, with a variable but small yellow spot on each side of clypeus, the swollen upper margin of prothorax and the tubercles bright chrome-yellow, but no other yellow about the insect, the legs wholly black, the tegulae entirely dark; flagellum very dark reddish beneath; head and thorax dull;



abdomen with the first segment smooth and shining, the others dull. Wings clear, nervures and stigma very dark brown; second s.m. large, subquadrate, receiving both recurrent nervures. The mesothorax is microscopically tessellate, with excessively minute punctures; the abdomen, beyond the first segment, has a microscopical transverse striation.

*Hab.* Como, New South Wales, two taken Nov. 1, 1902 (*Froggatt*, 35).

Looks at first sight like *P. amicula*, but easily separated by the reduced face-markings and entirely dark legs; *amicula* also has a delicately punctured abdomen, without any abrupt contrast between the first and second segments. It also recalls *P. nigropunctata*, Ckll., but that has a blue abdomen.

*Prosopis xanthaspis*, Cockerell.

The male, not before described, is very small (hardly  $5\frac{1}{2}$  mm. long).

Clypeus, labrum, and cuneate lateral face-marks (strongly notched above) primrose-yellow; no supraclypeal mark; yellow ornaments of thorax as in the female, except that the yellow of the tubercles is paler and reduced in amount, while the bright chrome-yellow patches of the scutellum and postscutellum are smaller (shorter), and there are no axillar spots; anterior tibiae in front, hind tibiae broadly at base, and all the basitarsi, white or very pale yellowish; metallic tint of abdomen very obscure.

*Hab.* Mackay, Queensland, March 1900 (*Turner*, 15 a). Two specimens.

In my table of Australian *Prosopis*, this runs to *P. metallica*, Sm., which has a strongly punctured abdomen; or among the non-metallic species to the group of *honesta*, *simillima*, and *metallica*, differing by its small size and the face-markings.

*Prosopis scintilla*, sp. n.

♀.—Length about 4 mm.

Looks like *P. eugeniella*, but face-marks reduced to a slender cream coloured line along rather more than the middle third of the inner orbital margins; labrum and mandibles ferruginous; antennae dark brown above, pale testaceous beneath (including scape), the flagellum thick; head round seen from in front; head and thorax dullish, abdomen convex, shining; thorax with no light markings; knees, anterior tibiae in front, and all the tarsi ferruginous;

tegulae testaceous. Wings clear, nervures and stigma dark reddish brown; stigma ordinary, considerably smaller than in *P. eugeniella*; recurrent nervures meeting the transverso-cubitals; vertex and mesothorax rough and coarsely punctured, the latter with scattered pale hair. Abdomen with very sparse excessively minute punctures, and minute transverse lineolation.

*Hab.* Mackay, Queensland, at flowers of *Eucalyptus*, Dec. 1899 (*Turner*, 1082). British Museum.

*Prosopis ancorata*, sp. n.

♂.—Length nearly  $4\frac{1}{2}$  mm.

Black, with creamy-white markings; head and thorax minutely granular-punctate; eyes converging below, face rather narrow; labrum and mandibles, clypeus (except a large cuneiform black mark on each side), and lateral face-marks, the latter long and narrow, filling space between clypeus and eye, abruptly notched by antennal sockets, and ending in a line a short distance above level of antennae; no supraclypeal mark; scape very short, cream-coloured on outer side; flagellum long, light ferruginous beneath; prothorax with two white lines on upper border and a small spot on tubercles; no other light colour on thorax; area of metathorax very large, semicircular, with irregular rugae; tegulae piccons with a light spot. Wings clear, with dark nervures and stigma; first r. n. entering second s.m., second r. n. joining second t.-c.; second s.m. rather long; anterior tibiae in front, and anterior and middle knees, ferruginous or testaceous; hind tibia narrowly at base, and hind basitarsus, white. Abdomen somewhat shining, scarcely punctured; venter normal.

*Hab.* Sydney, New South Wales, at flowers of *Angophora*, Nov. 24, 1910 (*Froggatt*, 107, in part).

In my table runs to 35, and runs out on account of the cream-coloured face-markings, which resemble those of *P. aureomaculata*, although the face is so much shorter than in *ancorata*.

*Prosopis eburniella*, sp. n.

♂.—Size and appearance of *P. ancorata*, but differing as follows: face broader and shorter, entirely ivory-white beneath the level of the antennae, with a supraclypeal mark which is about twice as broad as long, the lateral marks ending obliquely above, at an angle of about  $45^\circ$  with orbit, but at extreme apex prolonged along orbital margin in a small finger-like tip; flagellum much shorter, but scape

longer, black with an ivory-white mark near apex; thorax more shining; white lines on prothorax very narrow, but tubercles broadly white; area of metathorax hardly sculptured; tegulæ entirely black. Wings dusky; second s.m. shorter; anterior tibiæ in front, spot at base of middle tibiæ, basal half of hind tibiæ, and all the basitarsi white; apical part of abdomen above with short dark hair.

*Hab.* Sydney, New South Wales, at flowers of *Angophora*, Nov. 24, 1910 (*Froggatt*, 107, in part).

This runs to about the same place in the table as *P. ancorata*, but is very distinct from it. Except for the much shorter face, the face-markings resemble those of the European *P. hyalinata*.

*Meroglossa parallela* var. *recessiva*, v. nov.

♂.—No light mark on pleura behind tubercles; light marks on scutellum absent or reduced to a small spot, on post-scutellum reduced to a small spot on moderately large triangular mark.

*Hab.* Mackay, Queensland, at flowers of *Xanthorrhæa*, April 1900, also taken in May (*Turner*, 853). British Museum.

*Prosopis albonitens* var. *chromatica*, v. nov.

♀.—Light colour of prothorax and tubercles bright chrome-yellow.

*Hab.* Mackay, Queensland, at flowers of *Xanthorrhæa*, May 1899 (*Turner*, 712, in part). British Museum.

The mesothorax is more finely punctured than usual.

XV.—*Descriptions of new Species of Pyralidæ of the Subfamily Pyraustine.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

THE following descriptions of new *Pyraustine* are supplementary to my papers on the classification of that subfamily in the 'Proceedings of the Zoological Society,' 1898, pp. 590–761 and 1899, pp. 172–291. The numbers given refer to the position of the species in the genera in those papers. The types are in the British Museum, when not otherwise stated.

(4) *Neurophyseta camptogrammalis*, sp. n.

*Hydrocampa clymenalis*, Druce, Biol. Centr.-Am., Het. ii. p. 275 (part.), nec Wlk.

Fore wing with no glandular swelling on vein 1.

Head, thorax, and abdomen white tinged with ochreous; antennae fulvous; abdomen with slight subdorsal black spots on second and fifth segments and band on fourth segment. Fore wing white; obliquely placed subbasal black spots on costa and below cell; a brown antemedial line interrupted by orange below costa, angled outwards below costa, then oblique; a discoidal lunule defined by brown, open below, with orange streaks above it on costa and beyond it on veins 7, 6: a double brown postmedial line, the inner line arising from a black point on costa, rather oblique to vein 3, then bent inwards and diffused to lower angle of cell where it is interrupted, then oblique and rather diffused from submedian fold to middle of inner margin, the outer line oblique from costa to vein 3 near termen, then curved inwards to inner margin; subterminal line acutely bent outwards to apex where it is strong and black, then fine and brown, excurved to near termen at vein 3, then obsolete; cilia yellowish white. Hind wing white, with oblique pale brown postmedial line from vein 5 to tornus; a pale brown patch on termen in submedian interspace; cilia yellowish white.

*Hab.* GUATEMALA, Vera Paz (*Champion*), 1 ♂, Cerro Zunil (*Champion*), 1 ♀, Las Mercedes (*Champion*), 1 ♂, 1 ♀ type, Godman-Salvin Coll. *Exp.* 16-18 mm.

(5) *Neurophyseta normalis*, sp. n.

White; antennae tinged with yellow; mid-femora with slight black ring at extremity; abdomen with dorsal ochreous lines on first two segments. Fore wing with black point at base of costa and subbasal black spots on costa and below cell; an oblique ochreous antemedial line; a discoidal lunule defined by black except below, with ochreous streaks beyond it on the veins to the postmedial line, which is ochreous arising from a black striga on costa, excurved to vein 4, then retracted to below angle of cell and erect to inner margin, another ochreous line beyond it, oblique from costa to near termen at vein 3, then inwardly oblique and less distinct; a fine black subterminal line, excurved to apex and obsolescent towards tornus; the termen and cilia tinged with yellow. Hind wing with ochreous antemedial line from middle of cell to inner margin; an ochreous postmedial line, obsolete towards costa, excurved to lower angle of cell where it is angled inwards, then again slightly excurved; a curved ochreous subterminal line; the termen and cilia tinged with yellow.

*Hab.* W. INDIES, St. Vincent (*H. H. Smith*), 4 ♂, 1 ♀ type. *Exp.* 18 mm.



(6) *Neurophyseta arcigrammalis*, sp. n.

♂. White; palpi with black point at extremity of second joint; maxillary palpi with black point near extremity; antennæ tinged with yellow; fore coxæ with some fuscous hair at extremity, the femora and tibiæ fuscous above, the mid and hind tibiæ and tarsi with some black points; abdomen with black dorsal bar on second segment and slight ochreous lines on medial segments. Fore wing with black point at base of costa and subbasal spots on costa and below cell; an antemedial brown line angled outwards below costa, then oblique; a discoidal lunule defined by black except below, with some yellow above it on costa and brown streaks beyond it on the veins; a brown postmedial line arising from an oblique black striga on costa, excurved to vein 3 towards which there is a brown patch on its inner side, then retracted to below angle of cell and obsolescent, then erect to inner margin, another brown line beyond it, obliquely excurved from costa to vein 3, then obsolete; a fine black subterminal line, excurved to apex and obsolete towards tornus. Hind wing with slight brown antemedial line from middle of cell to inner margin; a brown postmedial line obliquely excurved from costa to vein 4, then incurved, and again excurved at vein 1; another brown line from costa beyond middle obliquely excurved to vein 2, then subterminal.

*Hab.* S. BRAZIL, São Paulo (Jones), 1 ♂ type. *Exp.* 20 mm.

(7) *Neurophyseta diplogrammalis*, sp. n.

♀. White; vertex of thorax and abdomen slightly tinged with yellow and with slight black points behind tegulæ. Fore wing slightly tinged with yellow in parts; subbasal black points below cell and on vein 1; traces of an ochreous antemedial line, oblique from costa to median nervure; a small discoidal lunule defined by fuscous except below and with slight yellow streaks beyond it on the veins; postmedial line double, yellow, obliquely curved from costa to vein 3 near termen, then obsolete; a fine fuscous subterminal line curved outwards to apex and obsolete below vein 3. Hind wing slightly tinged with yellow in parts; two brownish antemedial lines from middle of cell to inner margin; two brownish postmedial lines from below costa to tornus, the inner line slightly incurved from vein 5 to submedian fold.

*Hab.* BRAZIL, Organ Mts., Tijuca (Wagner), 1 ♀ type. *Exp.* 18 mm.

(8) *Neurophyseta albinalis*, sp. n.

*Hydrocampa clymenalis*, Druce, Biol. Centr.-Am., Het. ii. p. 275 (part.),  
nec Wlk.

*Hydrocampa debalis*, Druce, Biol. Centr.-Am., Het. ii. p. 276 (part.).

White; antennæ, thorax, and abdomen tinged with white. Fore wing with subbasal black point below costa; two dark marks on basal costal area; a curved fulvous antemedial line arising from a black point on costa; a narrow black discoidal annulus; a postmedial fulvous line arising from a black point on costa, sinuous, and at vein 3 recurved to the discoidal annulus; a slightly curved subterminal line from costa to vein 2; a yellow terminal band with black line on its inner side arising from a point below costa; a fuscous terminal line. Hind wing with curved fulvous antemedial line, a sinuous postmedial line excurved beyond the cell; a curved subterminal line; a yellow terminal band with black striæ on its inner edge and fuscous line on its outer edge.

Ab. 1. Fore wing with ochreous suffusion along the veins; both wings with the base of cilia deep ochreous.—W. Colombia.

*Hab.* COSTA RICA, Irazu (*Rogers*), 2 ♀, R. SUCIO (*Rogers*), 1 ♂, 1 ♀ type; GUATEMALA, Cubilguitz (*Champion*), 2 ♀, San Juan (*Champion*), 1 ♀; PANAMA, Chiriqui (*Champion*), 1 ♀ Godman-Salvin Coll.; W. COLOMBIA, San Antonio (*Palmer*), 1 ♂, 1 ♀; BRAZIL, N. Friburgo, 1 ♂, Organ Mts., Tijuca (*Wagner*), 1 ♂. *Exp.* 18 mm.

(9) *Neurophyseta argyroleuca*, sp. n.

♂. Head and thorax silvery white; palpi with some rufous at base; antennæ tinged with rufous; abdomen white dorsally banded with rufous. Fore wing silvery white; the costal edge deep rufous, the costal area suffused with rufous except towards base; the veins streaked with rufous; a subbasal rufous bar from cell to inner margin; antemedial line rufous, waved, from costal area to inner margin, followed by a narrow oblique rufous band; reniform defined by deep rufous except below, constricted at middle; postmedial line rufous, obliquely excurved from costa to below end of cell, then oblique, followed by an oblique deep rufous band; an oblique, minutely waved deep rufous line just before termen, the area beyond it tinged with yellowish rufous; cilia brownish at tips. Hind wing silvery white, with an oblique red-brown antemedial line from cell to inner margin; postmedial line red-brown, excurved below costa, then oblique; a slight somewhat dentate red-brown subterminal line from

below costa to submedian fold; a series of slight red-brown lunules just before termen; cilia tinged with red-brown at base; the underside with the lines more distinct, the antemedial and subterminal lines extending to costa, a slight discoidal striga.

*Hab.* PERU, Agualani (*Ockenden*), 1 ♂ type. *Exp.* 22 mm.

(10) *Neurophyseta albirufa*, sp. n.

♂. Head and thorax silvery white, the metathorax tinged with rufous; antennæ ringed with rufous; fore legs brown on inner side; abdomen white, suffused with rufous except at base. Fore wing rufous; an oblique silvery-white antemedial band from below costa to inner margin; a silvery-white discoidal bar confluent with an oblique quadrate silvery-white patch at lower angle of cell, its two outer angles somewhat produced; an elongate white spot in discal fold beyond the cell; a lunulate silvery-white patch from apex to vein 4 before termen; an oblique quadrate silvery-white patch at tornus; cilia white, brown at middle. Hind wing silvery white; traces of a red-brown antemedial line from cell to inner margin; postmedial line indistinct, red-brown, excurved from costa to vein 4, then incurved, excurved at vein 4 and ending in a spot at tornus, traces of another line beyond it from costa to discal fold; traces of rufous points on termen below apex and a red-brown bar at middle with small spot before it; the underside with some red-brown suffusion on middle of costa and in end of cell, a slight white discoidal lunule, the postmedial line distinct and double from costa to discal fold.

*Hab.* PERU, Agualani (*Ockenden*), 1 ♀ type. *Exp.* 22 mm.

(12 a) *Neurophyseta perrivalis*, sp. n.

♂. Head, thorax, and abdomen white slightly tinged with yellow; palpi with black point at extremity of second joint; metathorax with black bar; fore tibiae black on inner side; abdomen with black dorsal bars on second and third segments followed by brownish bars, lateral series of black striae and a ventral bar on anal segment. Fore wing white tinged with yellow; a very oblique blackish subbasal line followed by a yellowish line; antemedial line black, acutely angled outwards below costa, then oblique; discoidal lunule defined by black; postmedial line black, excurved below costa, incurved at discal fold, excurved to vein 2, then retracted to below end of cell, excurved above vein 1 and oblique to inner margin; an orange-yellow subterminal band, dentate to

termen below apex, incurved at discal fold and below vein 2; a black line just before termen bent outwards below apex; cilia orange with a fine black line near tips which are white. Hind wing white tinged with yellow; oblique black subbasal and antemedial lines; discoidal lunule defined by black; postmedial line black, excurved between veins 5 and 2, and curved round at inner margin to join the antemedial line; an orange-yellow subterminal band, excurved below costa and at middle, incurved at discal fold; a fine black terminal line; cilia orange with a fine black line near tips which are white.

*Hab.* W. COLOMBIA, San Antonio (*Palmer*), 1 ♂ type. *Exp.* 18 mm.

(14) *Neurophyseta auralis*, sp. n.

♀. White, strongly tinged with orange; maxillary palpi and patagia with black points; abdomen with dark dorsal spot at base and band on third segment. Fore wing with black points at base of costa and below cell; a subbasal orange spot on costa and three antemedial spots; a medial line acutely angled outwards below costa, then slightly sinuous; a black-edged discoidal lunule, with slight orange streaks on the veins beyond it; the postmedial line excurved from costa to vein 3, then bent inwards to below end of cell, angled outwards in submedian fold, and bent outwards to inner margin and with a curved orange line beyond it, angled inwards in submedian fold; a fine black subterminal line bent outwards to apex. Hind wing with fulvous subbasal and antemedial lines on inner area; a blackish discoidal lunule; a medial line excurved beyond cell, then sinuous; a curved postmedial line and a fine black subterminal line.

*Hab.* BRAZIL, São Paulo (*Jones*), 3 ♀ type. *Exp.* 18 mm.

(15) *Neurophyseta arcuatalis*, sp. n.

*Hydrocampa chymenalis*, Druce, Biol. Centr.-Am., Het. ii p. 275 (part.), nec Wilk.

♀. Head, thorax, and abdomen white slightly tinged with ochreous; palpi with black point at extremity of second joint; fore tibiae and tarsi tinged with fuscous; abdomen with subdorsal black spots on second segment and slight dorsal bands on terminal segments. Fore wing white, the base tinged with ochreous; obliquely placed black subbasal points below costa and cell; two very oblique orange antemedial striae from costa and an oblique pale brown line from subcostal nervure to inner margin; a discoidal lunule slightly defined by



fuscous except below, an orange streak above it on costa and the veins beyond it streaked with orange to termen; some pale brown suffusion from lower angle of cell to termen between veins 5 and 2: postmedial line double, with oblique black striga on the inner line at costa, then very minutely waved and excurved to vein 3, where it is bent inwards and almost obsolete, then as a faint single pale brown line from vein 3 to middle of inner margin: subterminal line black, stronger and bent outwards to apex, then fine, slightly excurved and parallel to termen to above tornus; a fine dark terminal line; cilia white tinged with golden brown and with a slight dark line near base. Hind wing white, the terminal area tinged with golden brown; two pale brown postmedial lines from below costa, excurved below vein 2 and the outer line ending at tornus; a slight subterminal line from costa to vein 3; a fine dark terminal line; cilia white tinged with golden brown, and with a slight dark line near base.

*Hub.* GUATEMALA, Las Mercedes (*Champion*), 1 ♀ type; PANAMA (*Champion*), 1 ♂, Godman-Salvin Coll. *Exp.* 16 mm.

(19) *Neurophyseta rufalis*, sp. n.

♂. Head and thorax rufous and whitish: pectus and legs whitish; abdomen rufous banded with whitish. Fore wing pale rufous, the basal, antemedial, and medial areas with some whitish except towards costa; curved diffused rufous subbasal and antemedial lines; a medial diffused line slightly angled outwards below costa, then very oblique; a small white discoidal lunule defined by rufous, with whitish streak from it to postmedial line, which is rufous defined by whitish on outer side, very oblique below vein 4 to inner margin before middle; a series of slight dark points just before termen. Hind wing whitish; a rather indistinct rufous antemedial line; a small discoidal spot defined by rufous; a rufous postmedial line excurved from costa to vein 4, then oblique; the terminal area suffused with rufous, with a series of slight dark points just before termen.

*Hub.* JAMAICA, Runaway Bay (*Walsingham*), 1 ♂ type. *Exp.* 14 mm.

(20) *Neurophyseta fulvalis*, sp. n.

Fore wing without swelling on vein 1, the apex produced and the termen excised below it; hind wing with the termen excurved at middle.

Head and thorax white; palpi with black points on first

and second joints and at extremity of maxillary palpi; tegulae with fulvous points; extremities of patagia and patches on pro- and metathorax fulvous; femora and tibiae with some black spots; abdomen white suffused with fulvous above. Fore wing fulvous; a white patch at base of costa and waved white subbasal and antemedial lines, the latter angled outwards below costa; black points at angles of cell with a waved white line from lower angle to inner margin; a dark postmedial line defined by white towards costa, excurved from below costa to vein 3, then incurved; a fine black subterminal line, bent outwards to apex where there is some white on its edges, incurved to inner margin; cilia brown. Hind wing pale fulvous, the inner area darker with a white antemedial line on it; the postmedial line defined by white on outer side, excurved from costa to vein 3 where it is bent inwards; a fine minutely waved black subterminal line with some white on its inner edge; cilia whitish, black at base towards tornus.

*Hab.* BRAZIL, São Paulo (Jones), 1 ♂, 1 ♀ type. *Exp.*, ♂ 18, ♀ 20 mm.

(5 a) *Homophysa flavidalis*, sp. n.

♂. Head and thorax white tinged with yellow; abdomen orange-yellow with slight white segmental lines. Fore wing fulvous yellow; a faint fulvous subbasal line slightly defined by whitish on outer side, angled outwards below costa, then oblique, sinuous; the antemedial line almost medial, angled outwards in cell, then oblique, sinuous and defined on each side by black scales, a diffused whitish band beyond it; the outer part of medial area finely pencilled with dark scales; postmedial line fulvous slightly defined by white on outer side, oblique from costa to vein 6, excurved to vein 4, then oblique, sinuous, a white spot beyond it on costa; a terminal series of black points and striga above tornus, the points towards apex on slight dentate white marks; cilia whitish at tips. Hind wing white tinged with yellow; a faint brown postmedial line excurved from costa to vein 2, then incurved; a terminal series of black striae and more prominent line at submedian interspace; cilia pure white at tips.

*Hab.* PARAGUAY, Sapucay (Foster), 2 ♂; ARGENTINA, Sante Fé, Ocampo (Wagner), 1 ♂ type. *Exp.* 16 mm.

(8 a) *Homophysa furvalis*, sp. n.

♀. Head, thorax, and abdomen whitish suffused with rufous except the base of abdomen; palpi banded with white. Fore wing whitish suffused with rufous, the terminal area deeper

rufous; subbasal line represented by a very oblique rufous striga from costa; antemedial line almost medial, rufous, oblique from costa to subcostal nervure, then inwardly oblique and slightly sinuous; postmedial line rufous, excurved from costa to vein 4, then oblique and angled inwards in submedian fold; the apex slightly tinged with white; a small black spot on termen at submedian fold with a point below it. Hind wing with the basal half whitish, the terminal half rufous; an antemedial rufous patch from cell to inner margin; a postmedial rufous line defined by whitish on outer side and bent outwards to tornus; a black point on termen at submedian fold, with white line from it to tornus.

*Hab.* MEXICO, Tabasco, Teapa (*H. H. Smith*), 2 ♀ type, Godman-Salvin Coll. *Exp.* 14 mm.

(11) *Homophysa dichordalis*, sp. n.

Head and thorax ochreous tinged with rufous; pectus, legs, and abdomen whitish. Fore wing ochreous tinged with rufous; the first line almost medial, brown, oblique from costa to subcostal nervure, erect to submedian fold, then inwardly oblique; a brown discoidal bar; postmedial line brown slightly defined by whitish on outer side, oblique towards costa, excurved to vein 4, then obliquely incurved; a terminal series of black points; cilia dark at tips. Hind wing whitish tinged with ochreous, the terminal area with rufous; a slight curved brown postmedial line from costa to submedian fold; some dark points on termen and the cilia rufous from apex to submedian fold, then whitish.

*Hab.* MEXICO, Presidio (*Forrer*), 1 ♀, Godman-Salvin Coll.; COLOMBIA, 1 ♀; SURINAM, Paramaribo (*Ellacombe*), 1 ♂ type; BRAZIL, Bahia (*Lacerda*), 1 ♀. *Exp.* 14–20 mm.

(12) *Homophysa distictalis*, sp. n.

♀. Head and thorax ochreous tinged with rufous; pectus and legs whitish; abdomen ochreous. Fore wing ochreous tinged with rufous, the medial area yellower except the costal area and cell; antemedial line white defined on each side by blackish, expanding into a white spot on costa, excurved from costa to median nervure, then incurved, interrupted by a diffused dark streak in cell; postmedial line white defined on each side by blackish, expanding into a wedge-shaped white spot on costa, excurved to vein 4, then incurved and slightly excurved again at vein 1; a series of small black spots on termen; cilia with dark line at middle and white tips. Hind wing white slightly tinged

with ochreous; faint traces of a brown postmedial line from costa to submedian fold; a terminal series of black points and the cilia ochreous at base with a dark medial line from apex to submedian fold, white at tips and towards tornus.

*Hab.* FR. GUIANA, Cayenne (*Schaus*), 1 ♀ type. *Exp.* 14 mm.

(13) *Homophysa albifascialis*, sp. n.

Head and thorax ochreous tinged with rufous; pectus and legs whitish; abdomen ochreous white irrorated with brown on dorsum. Fore wing ochreous tinged with rufous and irrorated with brown; a diffused brown medial line bent inwards to costa, with a white band beyond it diffused on outer side; an indistinct diffused brown postmedial line, oblique towards costa, excurved to vein 4, then inwardly oblique; a terminal brown line and series of slight black points; cilia with dark medial line and white tips. Hind wing white tinged with ochreous, the terminal area with rufous; a slight curved brown postmedial line from costa to submedian fold, faintly defined by whitish on outer side; a rather strigiform brown terminal line; cilia whitish, with fine dark lines at middle and near tips.

*Hab.* PERU, Callao (*J. J. Walker*), 2 ♀, Valparaiso (*J. J. Walker*), 1 ♀; ARGENTINA, Florenzia (*Wagner*), 3 ♂ type, Goya (*Perrins*), 4 ♀. *Exp.* 20-22 mm.

(5 a) *Scybalista rufescens*, sp. n.

♀. Head and thorax red-brown; pectus and legs white; abdomen pale reddish brown, dorsally suffused with dark brown. Fore wing red-brown; a dark medial line oblique from costa to discal fold, then sinuous; postmedial line dark, excurved, angled inwards in submedian fold; a terminal series of black points; cilia white at tips. Hind wing red-brown with some dark irroration, the costal area whitish; postmedial line dark, arising at vein 6 and excurved in submedian interspace; a terminal series of black points; cilia white at tips; the underside whitish tinged with rufous, a black discoidal point, the postmedial line formed of dark striae.

*Hab.* PANAMA, Cuna Mines (*Tylecote*), 1 ♀ type. *Exp.* 18 mm.

(9) *Scybalista leucostactalis*, sp. n.

Head and thorax white mixed with some red-brown; palpi banded brown and white; pectus and legs white, the fore tibiae banded with brown; abdomen red-brown with white



segmental lines. Fore wing red-brown with some darker irroration; an indistinct brown subbasal line excurved below costa, then incurved, with white patches before and beyond it on inner area; antemedial line brown slightly defined by white on inner side, oblique towards costa, angled inwards in submedian fold and with white patch beyond it from cell to above inner margin; a dark discoidal striga; postmedial line brown slightly defined by white on outer side, oblique towards costa, excurved to vein 1, then oblique, minutely waved and slightly angled inwards at vein 2; an oblique white striga from costa before apex; a terminal series of black points, the two below apex on slight white marks, some white on termen above tornus; the cilia with slight white marks below apex and above tornus. Hind wing white, the terminal area faintly tinged with rufous, more strongly in female; a faint brown postmedial line, excurved from costa to vein 2, where there is a dark striga and it is bent outwards; a punctiform blackish terminal line; cilia white, with two fine dark lines and a brown mark at base at submedian fold; the underside with the costal area irrorated with brown, a small discoidal spot, the postmedial line punctiform, a terminal series of small black lunules.

*Hab.* BRAZIL, Amazons, Obydos (*Austen*), 1 ♀; PERU, Callao (*J. J. Walker*), 3 ♂, 1 ♀ type; Valparaíso (*J. J. Walker*), 1 ♂, 1 ♀. *Exp.*, ♂ 18, ♀ 20 mm.

(1 a) *Symphysa discalis*, sp. n.

Head, thorax, and abdomen yellow; palpi at tips and frons tinged with fuscous; pectus, bands on tarsi, and ventral surface of abdomen white. Fore wing yellow; a subbasal series of three white points on an orange band; an antemedial series of six points on an orange band bent inwards to costa and angled inwards on median nervure; the area from just beyond middle to postmedial line on costa and to tornus on inner margin chestnut-brown partly suffused with purplish fuscous; white points at angles of cell; the postmedial line pale, strongly excurved from below costa to vein 3, then bent inwards and sinuous. Hind wing with the basal half semihyaline, the terminal half yellow with a subterminal chestnut patch extending from vein 5 to submedian fold with a pale line bordered by purple from vein 8 to the fold.

*Hab.* JAMAICA, Kingston (*Taylor*), 1 ♂ type. *Exp.*, ♂ 20, ♀ 22 mm.

(2 a) *Symphysa rufifusalis*, sp. n.

♀. Head, thorax, and abdomen white tinged with ochreous. Fore wing white slightly tinged with yellow; a broad medial band of rufous suffusion and irroration from below costa to inner margin, with a faint oblique waved brown line just beyond it from lower angle of cell to inner margin; a brown postmedial line, almost obsolete towards costa, excurved from costa to vein 4, then retracted towards lower angle of cell, then dark, diffused and sinuous to inner margin, a band of deep rufous suffusion beyond it, more prominent on inner area and extending to tornus. Hind wing yellowish white, the terminal area tinged with rufous, deeper in colour at middle.

*Hab.* PANAMA, La Chorrera (*Dolby-Tyler*), 1 ♀ type. *Exp.* 16 mm.

(4) *Voliba gigantea*, sp. n.

♀. Head and thorax reddish brown; abdomen whitish. Fore wing reddish brown irrorated with dark brown and with pale ochreous patches on inner area before the antemedial and beyond the postmedial lines; antemedial line dark brown, very oblique and slightly sinuous; a dark point in middle of cell, the reniform faintly defined by dark brown; postmedial line dark brown defined on outer side by ochreous, crenulate to vein 2, then bent inwards to origin of vein 2 where there is a blackish spot, and acutely angled outwards above and below vein 1; a terminal series of rather triangular black points; a fine ochreous line at base of cilia. Hind wing yellowish white, the terminal area tinged with rufous, broadly at costa, narrowing to tornus; a terminal series of black striae from apex to vein 2; cilia rufous at base, white at tips; the underside with the costal area suffused with red-brown from near base, extending on terminal area to vein 2, small dark spots at angles of cell, a rather diffused curved blackish subterminal line from costa to vein 2.

*Hab.* BR. N. GUINEA, Owgarra (*Meek*), 1 ♀ type. *Exp.* 44 mm.

(4) *Lipocosma nigrisquamalis*, sp. n.

♂. Head and thorax white; palpi with black spot at base of second segment and the extremity black; abdomen white tinged with brown except at base and extremity, the second to fourth segments dorsally suffused with black. Fore wing white, the terminal half faintly tinged with fulvous;

a few black scales below base of cell; traces of a brown antemedial line from vein 1 to inner margin and of a postmedial line irrorated with black scales from vein 2 to inner margin, incurved at vein 1; minute black points on termen towards apex and below vein 2. Hind wing white, the inner area tinged with brown except at base and with a patch of rough black scales at middle; a black point on termen below vein 2.

*Hab.* PANAMA, La Chorrera (*Dolby-Tyler*), 1 ♂ type. *Exp.* 12 mm.

(2) *Catapsephis melanostigma*, sp. n.

♂. Head, thorax, and abdomen white; palpi and frons marked with black. Fore wing with the basal half white; a yellowish patch at base of costa and indistinct antemedial band; the terminal half brown with some yellow on its inner edge, the white running to end of cell, where there is a white lunule on a black spot; the postmedial line white defined by a fuscous line on inner side, angled at vein 5 and with a white spot on its inner side, then retracted and interrupted to vein 2; a black terminal line with white line on its inner side; cilia white with black spot at apex and brown marks at middle. Hind wing white; a very prominent black discoidal spot; the postmedial line white with the area beyond it brown, its inner edge defined by a fuscous line, inside which is a brown band from cell to inner margin, the line strongly excurved between veins 5 and 2; a fuscous terminal line with some white on its inner side; cilia white with brown spot at apex and two at middle.

*Hab.* N. GUINEA, Kapaur (*Doherty*), 1 ♂ type; NEW GEORGIA (*Meek*), 1 ♂. *Exp.* 16 mm.

(2 a) *Sufetula obliquistrialis*, sp. n.

♂. Hind wing with fringe of long hair on upperside below costa.

Head and thorax brownish white mixed with fuscous; tarsi fuscous with pale rings; abdomen brownish white, with black dorsal bands on subbasal, medial, and subterminal segments. Fore wing whitish tinged with brown and irrorated with black; the basal area suffused with black-brown; antemedial line double filled in with white, angled outwards below costa, then obliquely curved; the medial part of costa with three very oblique wedge-shaped white marks filled in with black; a slight discoidal black point; postmedial line double, black filled in with white, incurved

below costa, angled outwards to near termen at discal fold, then strongly incurved and with some black suffusion beyond it; a subterminal black line angled outwards below apex, then incurved, angled outwards at vein 3, then oblique; a fine terminal black line; cilia whitish and black. Hind wing whitish suffused and irrorated with brown; some slight black striae on inner margin; some blackish suffusion below end of cell; postmedial line white defined on inner side by a black line and on outer by black suffusion, excurved below costa, then incurved to vein 2 where it is angled outwards to near termen, then almost obsolete to vein 1 and again prominent on inner area; a fine minutely waved black subterminal line from costa to vein 2; a fine black terminal line; cilia whitish, brownish at tips; the underside whitish suffused with brown, a slight dark discoidal lunule and faint whitish postmedial band defined on each side by brown.

*Hab.* LOUISIADES, Rossel I. (Meek), 1 ♂ type. *Exp.* 12 mm.

(2b) *Sufetula nigrescens*, sp. n.

Head and thorax brownish grey mixed with black; palpi black with white rings at extremities of second and third joints; the spurs and tarsi black ringed with white; abdomen brownish grey obscurely banded with black. Fore wing brownish grey suffused with black; antemedial line black defined on inner side by white, angled outwards below costa, in cell and submedian fold, then oblique to inner margin; a black discoidal spot; two yellowish white annuli on costa beyond middle; postmedial line black defined on outer side by white forming a small triangular spot on costa, oblique to discal fold, then inwardly oblique and sinuous; a black line just before termen from costa to submedian fold, excurved below costa and at middle; a fine black terminal line and yellowish white line at base of cilia. Hind wing brownish grey irrorated with black; a black discoidal spot with diffused line from it to inner margin; postmedial line black defined on outer side by grey, oblique, minutely waved, with blackish suffusion beyond it extending on costal area to termen; a sinuous black line just before termen from costa to vein 1; a fine black terminal line and pale line at base of cilia; the underside grey irrorated with fuscous, a black discoidal spot, the postmedial line defined on outer side by whitish.

*Hab.* SIERRA LEONE (Clements), 1 ♂ type; S. NIGERIA, Niger R. (Dudgeon), 1 ♀, Sapele (Sampson), 3 ♀. *Exp.* 18-22 mm.



(2 e) *Sufetula bilinealis*, sp. n.

♂. Head and thorax fuscous brown with a cupreous tinge; palpi white at base, the maxillary palpi tipped with white; frons with two fine white lines on each side; pectus and legs white tinged with brown, the tarsi fuscous ringed with white; abdomen pale fuscous brown with white segmental lines, the ventral surface blackish. Fore wing black-brown with a cupreous gloss; a curved slightly sinuous white antemedial line; two white points on middle of costa and three small annuli on postmedial part of costa; a black discoidal bar defined on outer side by white; subterminal line white arising from the third annulus, sinuous, two minute white points beyond it on costa; cilia white at base, blackish at tips. Hind wing white suffused with fuscous except on inner area; a black discoidal spot; postmedial line white, sinuous; cilia white at base, blackish at tips; the underside whitish, the costal and terminal areas irrorated with fuscous, a black point at base of cell, the postmedial line defined on each side by blackish, angled inwards above vein 5.

*Hab.* DUTCH N. GUINEA, Snow Mts., Oetakwa R. (*Meek*), 1 ♀ type. *Exp.* 18 mm.

(4 a) *Sufetula pygmæa*, sp. n.

♀. Head, thorax, and abdomen grey suffused with brown; pectus, legs, and ventral surface of abdomen whitish tinged with brown. Fore wing grey suffused with brown; antemedial line blackish, waved; an oblique blackish striga from middle of costa; a small black discoidal spot placed on the postmedial line, which is blackish defined on outer side by white, excurved to vein 4, then incurved; an indistinct whitish subterminal line defined on inner side by brown, excurved at middle; a terminal series of black points defined on inner side by white. Hind wing grey suffused with brown; a blackish antemedial line from cell to inner margin; a blackish discoidal point; postmedial line indistinct, dark defined on outer side by whitish; a terminal series of black strigæ defined on inner side by whitish; the underside whiter with the black discoidal spot prominent.

*Hab.* Mexico, San Blas (*Walker*), 1 ♀ type. *Exp.* 10 mm.

(3 a) *Sufetula polystrialis*, sp. n.

Head and thorax ochreous mixed with brown; palpi and maxillary palpi white banded with black; frons white; tegulæ with black medial line and white tips; patagia white with black bands at base, middle, and tips; tarsi banded

with black : abdomen ochreous with black and white dorsal segmental lines, the ventral surface whitish with sublateral series of dark points. Fore wing ochreous white tinged and irrorated with brown, the costal area suffused with brown : a short brown streak on base of median nervure : an oblique whitish subbasal striga from costa with a slight blackish streak below costa from it to antemedial line, which is whitish, oblique, and defined by a black line on outer side from costa to submedian fold, then bent inwards to base of inner margin and defined by a brown fascia above ; the medial part of costa with two whitish semicircular marks : a small black discoidal spot ; whitish streaks with diffused dark streaks between them on veins 7, 6, 5, 4 to the postmedial line, which is whitish defined by a black line on inner side, expanding at costa, oblique to vein 4, then bent inwards and ending at the angle of antemedial line in submedian fold, a triangular patch of blackish suffusion beyond it at costa and some fuscous and brown suffusion below its retracted portion : a very oblique white streak defined on each side by brown from submedian fold beyond middle to middle of inner margin ; a black subterminal line, incurved at the excision below apex and bent inwards along terminal part of inner margin ; cilia whitish with a fuscous line through them. Hind wing ochreous white tinged and irrorated with brown ; an oblique diffused blackish medial line defined by white on outer side on inner area : a very oblique white postmedial line defined on inner side by a black line and on outer by dark suffusion ; a black subterminal line defined by white on inner side, incurved at discal fold ; cilia white with a waved black line near base.

*Hab.* N. GUINEA, Milne Bay (*Meek*), 1 ♀ ; LOUISIADES, St. Aignan I. (*Meek*), 1 ♂, 1 ♀ type. *Eap.*, ♂ 18, ♀ 20 mm.

(4*b*) *Sufetula cyanolepis*, sp. n.

♂. Head and thorax ochreous suffused with black-brown ; palpi and maxillary palpi blackish ; pectus and legs ochreous, the tarsi banded with black ; abdomen ochreous with diffused blackish segmental dorsal bands except at base. Fore wing ochreous largely suffused with red-brown and fuscous, and with scattered patches of silvery-blue scales ; the base and costal area to antemedial line blackish ; the antemedial line ochreous defined on each side by blackish and with silvery-blue scales on its outer edges, oblique from costa to submedian fold, then incurved ; two minute semicircular marks defined by black on medial part of costa : a diffused blackish discoidal annulus ; postmedial line ochreous defined on each side by

blackish and with silvery-blue scales on its inner edge, incurved below costa, angled outwards at discal fold, then oblique: some minute silvery-blue streaks before termen; a dark terminal line incurved at the excision below apex; cilia ochreous and fuscous with some silvery-blue scales. Hind wing ochreous; a diffused oblique medial black-brown band from cell to inner margin; an ochreous postmedial line, obsolete on costal area, then defined on inner side by a black line and with a broad diffused blackish band on outer; a subterminal series of diffused black striae with slight patches of silvery-blue scales before termen on costal half; cilia ochreous mixed with black.

*Hab.* S. CELEBES (*Doherty*), 1 ♂ type. *Exp.* 14 mm.

(7) *Sufetula trichophysetis*, sp. n.

♀. Head, thorax, and abdomen whitish suffused with ochreous; palpi and maxillary palpi rather darker at tips. Fore wing whitish suffused with ochreous yellow; an indistinct double waved curved antemedial line, the inner line diffused; postmedial line double, ochreous, oblique from costa to vein 6, then minutely waved, excurved to vein 4, then oblique; a faint diffused ochreous subterminal line; a slight oblique dark subapical striga; a slight dark terminal line from just below apex to vein 4, incurved at the excision below apex. Hind wing whitish suffused with ochreous yellow; the basal half of submedian fold with fringe of long spatulate scales; indistinct double waved brownish medial and postmedial lines from discal fold to inner margin or on inner area only.

*Hab.* GOLD COAST, Accra (*Carter*), 3 ♀ type. *Exp.* 14-16 mm.

(2) *Erpis pacificalis*, sp. n.

♂. Head, thorax, and abdomen greyish ochreous tinged with brown; palpi at base, pectus, and ventral surface of abdomen white, anal segment with a fuscous band before the tuft. Fore wing thinly scaled, pale ochreous tinged with brown, rather darker on terminal area; a fuscous spot in middle of cell and slightly curved, diffused antemedial line from cell to inner margin; a fuscous discoidal lunule; postmedial line fuscous, diffused, excurved between veins 7 and 5, at vein 3 retracted to lower angle of cell, then slightly oblique to inner margin and excurved at vein 1. Hind wing thinly scaled, pale ochreous tinged with brown, rather darker on terminal area; a fuscous discoidal spot; postmedial line

fuscous, rather diffused, oblique from costa to vein 3, then angled inwards, excurved again at vein 1 and bent inwards to above inner margin; termen fuscous brown; cilia white.

*Hab.* PERRY'S GROUP, Bonin Is., 2 ♂ type. *Exp.* 22 mm.

(7 a) *Massepha syngamiodes*, sp. n.

♂. Head, thorax, and abdomen yellow-brown mixed with some white; palpi white with some brown on first joint and a brown point near extremity of second joint; frons white at sides and above; pectus, legs, and ventral surface of abdomen white, the fore femora and tibiae tinged with brown. Fore wing yellow-brown; antemedial line fuscous with a white band on its inner side, excurved, slightly bent outwards to inner margin; a quadrate white patch in end of cell with oblique black striga from subcostal nervure near its inner edge and the blackish discoidal bar on its outer edge; some whitish on costa before the postmedial line which is blackish with a white band on its outer side, slightly incurved from below costa to vein 5 where it is bent outwards, at vein 2 retracted to below end of cell, then slightly excurved; a blackish terminal line; cilia whitish with a slight dark line near base. Hind wing yellow-brown irrorated with whitish; a blackish discoidal spot defined by white; postmedial line blackish defined on outer side by white, slightly incurved from below costa to vein 5 where it is bent outwards, at vein 2 retracted to below end of cell and almost obsolete, then oblique to inner margin near tornus; a black terminal line with some white before it towards apex and in submedian interspace; cilia brownish at base, white at tips.

*Hab.* ARGENTINA, Tucuman, Los Vasquez (*Dinelly*), 1 ♂ type. *Exp.* 22 mm.

(7 b) *Massepha cuprescens*, sp. n.

♂. Head, thorax, and abdomen red-brown with a cupreous gloss, the pectus and ventral surface of abdomen paler. Fore wing red-brown with a cupreous gloss; the first line almost medial, blackish defined on inner side by whitish with a darker brown shade before it, erect, minutely waved; a diffused dark discoidal spot; postmedial line blackish defined on outer side by whitish, obliquely excurved and minutely dentate to vein 4, then bent inwards to lower angle of cell and again strongly excurved above vein 1; a fine whitish line at base of cilia. Hind wing white tinged with cupreous brown; a dark minutely waved postmedial line; cilia with a brown line near base.



*Hub.* S. BRAZIL, São Paulo (*D. Jones*), 1 ♂ type. *Exp.* 22 mm.

(7 c) *Massepha longipennis*, sp. n.

♂. Head, thorax, and abdomen white tinged with ochreous brown; palpi with the second joint black above; lower part of frons black at sides; fore and mid femora at extremity and fore tibiae above blackish. Fore wing long and narrow, pale ochreous, the costal area slightly tinged with brown; black points at base of costa and below cell; a black point in middle of cell on a faint diffused incomplete dark line; a small black discoidal spot; a diffused fuscous postmedial line, oblique towards costa, at vein 2 retracted to lower angle of cell and obsolescent, then erect to inner margin; a fine fuscous terminal line. Hind wing pale ochreous: a black discoidal spot; a diffused fuscous postmedial line oblique from costa to vein 3, then retracted to lower angle of cell and obsolescent, then strong and oblique to tornus; a fine fuscous terminal line; cilia with slight brown line through them and whitish tips.

*Hub.* CAMEROONS (*Sjostedt*), 2 ♂ type. *Exp.* 20 mm.

(2) *Aulacoptera philippinensis*, sp. n.

Fore wing of male normal.

Head and thorax yellow tinged with reddish brown; abdomen white tinged with yellow and reddish brown. Fore wing yellow tinged in parts with red-brown, the basal half of costa dark brown; some diffused red-brown below base of cell; two sinuous red-brown antemedial lines; a diffused red-brown discoidal annulus; postmedial line diffused, red-brown, obliquely curved from costa to below end of cell, then oblique, followed by another diffused oblique somewhat maculate line; a diffused waved subterminal line, incurved below costa and excurved at middle; cilia reddish brown. Hind wing white, the termen and cilia tinged with yellowish; a slight sinuous red-brown postmedial line and waved red-brown subterminal line excurved at middle; the underside with the costa tinged with rufous.

*Hub.* PHILIPPINES, Negros I. (*Whitehead*), 9 ♂, 2 ♀ type, Samar I. (*Whitehead*), 1 ♀. *Exp.* 18 mm.

(5 b) *Entephria subpictalis*, sp. n.

Vertex of head with tuft of hair: male with tufts of hair

from pectus at origin of fore wing and from mid coxæ ; wings long and narrow.

Head and thorax yellowish suffused with red-brown ; palpi black above, except third joint ; maxillary palpi black ; fore tibiae at base and extremity and first joint of tarsus with black bands ; abdomen pale yellow, the second and third segments dorsally suffused with brown. Fore wing pale yellow suffused with rufous except the basal part of medial area and the inner area except at base ; indistinct brown subbasal and antemedial lines ; a dark point in middle of cell and discoidal striga with semicircular mark above it on costa followed by some dark points ; postmedial line indistinct, brown, slightly defined by yellowish on outer side, somewhat angled inwards at discal fold, at vein 2 retracted to lower angle of cell, then oblique to inner margin ; a terminal series of slight brown spots ; cilia yellowish at base, with dark medial line and brown tips. Hind wing yellowish white almost wholly suffused with dark brown, leaving the costal area, cell, and a spot on termen at vein 3 pale ; a small blackish discoidal spot on a yellowish patch ; postmedial line dark defined by yellowish white on outer side, sinuous, at vein 2 retracted to lower angle of cell and ending on inner margin above tornus ; a dark line on apical part of termen ; cilia yellowish white with some dark points towards apex and a blackish spot at base at tornus. Underside of fore wing variegated with dark brown, forming patches beyond the postmedial line at costa, middle, and in its sinus and subterminal spots below apex and at middle ; hind wing whitish with black discoidal spot and postmedial line, some brown suffusion before the latter on costal half, an apical patch and subterminal spot between veins 5, 4.

*Hab.* SIERRA LEONE (Clements), 8 ♂, 1 ♀ type. *Exp.* 18-20 mm.

(17 a) *Entephria searpunctalis*, sp. n.

White ; patagia with black points. Fore wing with subbasal black spot below the cell ; a black point at base of costa and antemedial spot ; a discoidal spot ; a medial spot below the cell and a spot beyond lower angle ; a postmedial spot on costa ; a black-brown shade on middle of inner margin ; a brownish band on termen towards tornus at middle expanding inwards into a patch with a black spot on its upper edge at vein 5. Hind wing semihyaline, the termen brown towards apex.

*Hab.* SIERRA LEONE (*Austen*), 1 ♀ type; S. NIGERIA, Warri (*Roth*). *Exp.* 16 mm.

(19 a) *Entephria geminipuncta*, sp. n.

♂. Head, thorax, and abdomen pure white; palpi black above at base; maxillary palpi black at base; fore legs blackish in front; abdomen with faint brownish dorsal segmental lines except towards base, the anal segment with black spot above. Fore wing silvery white; a subbasal black bar from costa to below the cell; an oblique antemedial black line expanding into a spot at costa; a black bar from origin of vein 2 to vein 1 and an elliptical black discoidal spot; postmedial line black, slightly excurved beyond the cell and followed by another straight oblique black line; subterminal line black, slightly curved; a black line near base of cilia. Hind wing silvery white with two black discoidal spots, two very slightly curved black postmedial lines, a curved black subterminal line, and black line near base of cilia.

*Hab.* W. CHINA, Shen-se, Sin-ling (*Maw*), 1 ♂ type. *Exp.* 24 mm.

(22 a) *Entephria staminalis*, sp. n.

*Epichronistis cyclonalis*, Druce, Biol. Centr.-Am., Het. ii. p. 258 (part.).

♂. Head, thorax, and abdomen ochreous white faintly tinged with rufous; palpi white at base, red-brown at tips; frons red-brown; fore tibiae red-brown at extremities. Fore wing ochreous white slightly irrorated with rufous, the costal and terminal areas tinged with rufous; a brown subbasal striga from costa; antemedial line with brown striga from costa, then faint, oblique, sinuous; a brown point in middle of cell and two discoidal points connected by some brown scales; postmedial line brown, punctiform and sinuous from costa to below vein 3, then almost obsolete and retracted to beyond lower angle of cell, then erect and sinuous to inner margin; a faint brown shade at middle of terminal area; a terminal series of dark strigæ; cilia with a dark line through them. Hind wing ochreous white slightly irrorated with brown; a slight discoidal striga; postmedial line indistinct, bent outwards and minutely waved between veins 5 and 2, then retracted to below angle of cell and oblique to above tornus; a fine brown terminal line and brown line through the cilia.

*Hab.* GUATEMALA, Vera Paz, San Gerónimo (*Champion*), 1 ♂ type, Godman-Salvin Coll. *Exp.* 32 mm.

(25) *Entephria albivittalis*, sp. n.

♂. Head, thorax, and abdomen deep fuscous brown; fore coxæ on inner side and the tibiæ and tarsi in front white. Fore wing deep fuscous brown with a cupreous gloss especially on inner area; five obscure small black spots in and just beyond end of cell with whitish points between them; a postmedial series of short white streaks on veins 7 to 3; a terminal series of black striae with white points between them and a series of whitish spots at base of cilia. Hind wing grey, suffused with fuscous brown especially on terminal area; a terminal series of dark striae with whitish points between them; cilia whitish with a dark line through them. Underside of fore wing with slight white streaks in the interspaces of terminal area.

*Hab.* NATAL, Durban (*A. T. Cook*), 1 ♂ type. *Exp.* 38 mm.

(4) *Rehimena unimaculalis*, sp. n.

♂. Golden yellow; palpi with the second joint black in front; frons, pectus, and ventral surface of abdomen white. Fore wing with deep black discoidal lunule; traces of a terminal series of fuscous points. Hind wing rather paler yellow; a terminal black band between veins 7 and 2, expanding triangularly at vein 7, then narrowing to a line.

*Hab.* SINGAPORE (*Ridley*), 2 ♂ type. *Exp.* 16 mm.

(4) *Zinckenia lophoceralis*, sp. n.

Antennæ of male with ridge of scales on base of shaft above.

♂. Head, thorax, and abdomen black-brown; base of palpi and front of pectus white; mid femora at extremity, the tibiæ below, and tarsi white; hind femora at extremity white, the tarsi whitish ringed with fuscous; ventral surface of abdomen white. Fore wing black-brown; a small white spot in middle of cell and another beyond the cell above vein 5, a point in submedian fold below origin of vein 2. Hind wing black-brown; a white bar below origin of vein 2; a white patch beyond the cell between veins 6



and 2, expanding and with its outer edge rather dentate between veins 5 and 2.

♀. Abdomen with dorsal white band on second segment; fore wing with rather irregular erect subbasal white line from below costa to inner margin, an irregular white bar from below costa across middle of cell, conjoined to a small spot below origin of vein 2, with an oblique white bar beyond it from vein 2 to inner margin; a postmedial white line from below costa to vein 5, followed by small spots rather further from base above veins 4, 3 and a wedge-shaped spot above vein 2 extending to near termen, a fine white line at base of cilia and a white patch above tornus; hind wing with broad white subbasal band with waved edges; an oblique medial band from below costa to above tornus expanding outwardly between veins 5 and 2, then sinuous, two small postmedial spots above veins 4, 3 conjoined to a wedge-shaped spot above vein 2 extending to near termen, a fine white line at base of cilia.

*Hab.* NEW GUINEA, Milne Bay (*Meek*), 2 ♂, 1 ♀ type  
*Exp.* 34 mm.

(6) *Tabidia nacoleialis*, sp. n.

♂. Head and thorax grey-brown; pectus and legs whitish; abdomen grey-brown, the terminal half and ventral surface whitish. Fore wing grey-brown slightly irrorated with fuscous; a slight dark mark in base of cell; antemedial obliquely placed dark points below costa and in cell and a bar from submedian fold to inner margin; a slight blackish discoidal lunule; postmedial line very minutely waved and slightly defined by whitish on outer side, somewhat incurved from costa to vein 6, then bent outwards and excurved to vein 2, then retracted to below angle of cell and erect to inner margin; a terminal series of small fuscous spots. Hind wing grey-brown slightly irrorated with fuscous; some fuscous subbasal suffusion with whitish suffusion beyond it; postmedial line diffused and slightly defined by whitish on outer side, somewhat incurved from costa to vein 5, then bent outwards and excurved to vein 2, then retracted towards lower angle of cell and diffused to tornus; a terminal series of small fuscous spots.

*Hab.* PENANG (*Ridley*), 1 ♂ type. *Exp.* 22 mm.

(13 a) *Agrotera pyrostrota*, sp. n.

♀. Head and thorax bright yellow slightly tinged with fiery red, the tegulae and thorax with brown dorsal fascia defined at sides by fiery red on tegulae; antennae blackish except basal joint; palpi fiery red with the third joint yellow; fore femora and tibiae on inner side and the tarsi black, the tibiae tinged with red on outer side; abdomen pale yellow dorsally suffused with brown. Fore wing bright yellow with slight fiery-red irroration on medial area, the costal area suffused with fiery red to middle; a slight fiery-red subbasal line, angled outwards on median nervure and ending at vein 1, a diffused triangular patch of blackish and red suffusion beyond it from costa to just below the cell; a small round fiery-red spot in middle of cell; an obliquely curved blackish band suffused with silvery blue from upper angle of cell to inner margin, joined at lower angle of cell by a similar oblique fascia from apex, some fiery-red suffusion below costa in the fork of these bands, on costal area towards apex, and beyond the band on tornal area; three slight fiery-red spots on middle of termen. Hind wing semihyaline white, the terminal half tinged with yellow. Underside of fore wing with the postmedial band black-brown.

*Hab.* BR. N. GUINEA, Owgarra (*Meek*), 1 ♀ type. *Exp.* 36 mm.

(2 a) *Desmia mesosticta*, sp. n.

♂. Head and thorax dark brown; palpi white at base; pectus white; legs white and brown; abdomen brown with white segmental lines except on basal segments and white streak on anal segment, the ventral surface white except towards extremity. Fore wing dark brown with a cupreous tinge; a white medial band from below costa to inner margin, expanding and its outer edge angled in and just below cell, then incurved, a small white spot beyond it below base of vein 2; a postmedial white band from costa to vein 4 where it ends in a point, its outer edge dentate; cilia white with series of brown spots. Hind wing dark brown with a cupreous tinge; a medial wedge-shaped white band from costa to vein 1, then bent outwards as an oblique white line to above tornus and with oblique white striga before it, a black bar near its outer edge beyond the cell; cilia white with a black line through them.

*Ab.* 1. Fore wing with the spot beyond the medial band

connected by an oblique white line with inner margin; hind wing without the oblique striga above inner margin.—Br. Guiana.

*Hab.* W. COLOMBIA, Jiminez, 1 ♂ type; Br. GUIANA, Demerara (*Rodway*), 1 ♂. *Exp.* 26 mm.

(3 a) *Desmia bifidalis*, sp. n.

*Desmia geminalis*, Druce, Biol. Centr.-Am., Het. ii. p. 260 (part.), nec Snellen.

♂. Brown with a cupreous gloss; vertex of head and extremity of patagia pale; abdomen with pale brown dorsal patch on anal segment; palpi at base and throat white; pectus, the greater part of legs, and ventral surface of abdomen ochreous white. Fore wing with bifid ochreous white spot in and below middle of cell, defined by blackish and connected with inner margin by a dark line; an ochreous-white patch beyond the cell between veins 8 and 4 with rather irregular outer edge, defined by blackish; a fine pale line at base of cilia. Hind wing with narrow ochreous white band from below middle of costa to above tornus where it narrows to a point, defined by blackish on inner side and beyond the cell, its inner edge slightly angled inwards below the cell; cilia white with a black line through them.

*Hab.* MEXICO, Vera Cruz. Atoyac (*Schumann*), 1 ♂ type, Godman-Salvin Coll. *Exp.* 34 mm.

Subsp. 1. Fore wing with the markings white, the medial spot completely divided, the lower part of postmedial spot expanding on outer side; hind wing with the markings white, the medial band expanding into a patch between veins 6 and 2.

*Hab.* PERU, 1 ♂. *Exp.* 38 mm.

(5 a) *Desmia dentipuncta*, sp. n.

♂. Head and thorax dark brown, the vertex of head with slight whitish streak; palpi white at base; pectus white; legs brown and white; abdomen dark brown, with segmental white lines except towards base and white streak on anal segment, the ventral surface white except towards extremity. Fore wing dark brown with a cupreous gloss; a medial white band from below costa to inner margin, its outer edge expanding into rounded lobes in and below the cell, a small white spot beyond it below base of vein 2 connected by an oblique line with inner margin; a postmedial wedge-shaped white band from costa to vein 4, its outer edge

dentate and with four minute dentate white spots beyond it; cilia white with a black line through them. Hind wing dark brown with a cupreous tinge; a medial oblique wedge-shaped white band from costa to above inner margin, its outer edge excurved and enclosing a black bar beyond the cell; cilia white with a black line through them.

*Hab.* W. COLOMBIA, Jimenez, 2 ♂ type. *Exp.* 30 mm.

(5 b) *Desmia ufeodalis*, sp. n.

*Desmia ufeus*, Druce, Biol. Centr.-Am., Het. ii. p. 261 (nec Cram.).

Antennæ of male with the shaft excised at middle and with scale-tooth before it; hind wing with slight furrow above vein 6, the termen slightly excised below apex.

♂. Reddish brown; abdomen with white band on third segment followed by white irroration and white segmental lines, a streak on anal segment; palpi at base and throat white; legs white and brown; abdomen with the ventral surface white with some red-brown on terminal segment. Fore wing with bifid white antemedial points in and above cell; a medial white band from just below costa to inner margin expanding somewhat in cell, then oblique and followed by an incurved white line from vein 2 to inner margin; a wedge-shaped postmedial white patch from costa to vein 3, its outer edge dentate, the area before it yellowish with slight whitish discoidal bar defined by blackish; cilia white with a black line near base. Hind wing with broad oblique medial white band narrowing to inner margin and with small black lunule on it beyond the cell, concave towards base; cilia white with a black line through them.

*Hab.* MEXICO, Tabasco, Teapa (*H. H. Smith*), 1 ♂ type; GUATEMALA, San Isidro (*Champion*), 1 ♂, Godman-Salvin Coll. *Exp.* 28 mm.

Subsp. 1. Rather darker brown; fore wing without the bifid antemedial point, the line beyond the medial band replaced by a point below vein 2, the postmedial band not wedge-shaped and expanding below without the yellowish and discoidal striga before it; hind wing with the lower part of medial band bent outwards as an oblique line to tornus.

*Hab.* PARAGUAY, Sapucay (*Foster*), 2 ♂.

[To be continued.]



## MISCELLANEOUS.

*Note on the Date of Publication of the Works of Jacob Hübner on the Lepidoptera.* By C. DAVIES SHERBORN and LOUIS B. PROUT.

THE elucidation of the dates of publication of Hübner's works has exercised the ingenuity of many persons. The more valuable papers written on the subject are those of Scudder (Proc. Amer. Acad. Sci. x. 1875, pp. 91-293) and C. H. Fernald (Svo. Amherst, Mass., 1905, 16 pp.). Considerable time and trouble have been expended in recent years by J. H. Durrant, Lord Walsingham, Sir George Hampson, Hon. Walter Rothschild, and others in this country, and a mass of manuscript notes has been placed at our disposal by Durrant and others as assistance in a sort of forlorn hope attack on the subject.

Although the result has been but slight, it seems worth while to briefly sum up our present position regarding these obscure and troublesome publications. We will take them in order of date.

1. Beitr. Geschichte Schmett. 2 vols. Svo. Augsburg, I. (1) 1786; I. (2) 1787; I. (3) 1788; I. (4) 1789; II. 1790.  
[Heinsius, Allgem. Bücher-Lexicon, ii. 1812, p. 445, says 2 vols. 1787-1792. Engelmann, Bibl. Hist. Nat. 1846, p. 489, and Hagen, Bibl. Entom. 1862, p. 387, both close vol. ii. in 1790.]

2. Samml. auserl. Vögel u. Schmett. Svo. Augsburg, 1793.  
[Geyer, Entom. Archiv (Thon's), p. 28, says 1792; Engelmann, Bibl. Hist. Nat. 1846, p. 489, says 1793; Wiedmann, Allgem. Verz. Bücher . . . Ostermesse, 1793, p. 60, says "1<sup>r</sup>-8<sup>r</sup> Heft, wird fortgesetzt."]

3. Samml. europ. Schmett. 4to. Augsburg, 1796-1841.

For all published up to Dec. 24th, 1799, see Sherborn and Durrant, Ann. & Mag. Nat. Hist. (7) ii. Dec., 1898, pp. 491-495, here tabulated as:—

II. Horde (Sphinx), pp. 1-32.	1796.
V. Horde (Geom.), pp. 1-24.	1800.
VI. Horde (Pyral.), pp. 1-16, 1-30.	1796.
VII. Horde (Tort.), pp. 1-16.	1796.
VIII. Horde (Tineæ), pp. 1-70.	1796.

For the rest:—

Ziefer, pp. 194. 1805. Different paper is used at Aa, p. 179, and new type (see t in Noctua=a new printer); but C. Geyer, in Hübner, Samml. europ. Schmett. (4 Horde) 1834, p. iv, says "Noctua 1805," so we regard all as issued in this year.

Nachtrag, pp. 1-8. 1824.

VII. Horde (Tort.), pp. 1-16. 1830. By Froelich.

IV. Horde (Noct.), pp. 1-16. 1834. By Geyer.

Plates:—

We have little new evidence as to date, so quote them as

"Fernaldo judice," according to his paper, which includes those worked out by Durrant and Sherborn; and reprint his list:—

1. Papiliones ...	Pls.	1-88.	1799.	148-150.	1817.
		89-96.	1802.	151-154.	1818-1822.
		97-114.	1804.	155-161.	1823.
		115-124.	1805.	162-195.	1823-1833 *.
		125-128.	1808.	196.	1834.
2. Sphingæ ..	Pls.	129-147.	1808-1816.	197-207.	1834-1841.
		1.	1796.	31-34.	1818-1822.
		17.	1799.	35.	1827.
		18-23.	1802-1808.	36.	1828.
		24-30.	1808-1818 †.	37-38.	1840.
3. Bombyces ...	Pls.	1-42.	1802.	68-69.	1823-1827.
		43-57.	1802-1808.	70.	1827.
		58-59.	1808-1810.	71-74.	1828.
		60-63.	1810-1818 †.	75-76.	1829.
		64-66.	1818-1822.	77-80.	1831.
4. Nocturæ .....	Pls.	67.	1823.	81-83.	1834-1841.
		1-74.	1802.	151.	1823.
		75-86.	1802-1808.	152-169.	1826-1833 †.
		87-94.	1808.	170-176.	1834.
		95-139.	1808-1818 †.	177-185.	1834-1841.
5. Geometræ ...	Pls.	140-150.	1818-1822.		
		1-60.	1798.	103-105.	1828.
		61-66.	1800-1808.	106-108.	1828-1833.
		67-95.	1808-1818 †.	109-111.	1834.
		96-100.	1818-1822.	112-113.	1834-1841.
		101-102.	1827.		

[Pl. 71 was ante Feb. 1808, for it is quoted in Jena, Allgem. Lit. Zeit. 1808, i. no. 25, p. 279, of that date.]

6. Pyralides ...	Pls.	1-20.	1796.	28-29.	1818-1822.
		21.	1799.	30.	1823.
		22-23.	1800-1811.	31.	1832.
		24-27.	1811-1818 †.	32.	1834.
7. Tortrices ...	Pls.	1-29.	1797.	46.	1823.
		30.	1799.	47.	1828.
		31-41.	1811-1818 †.	48-52.	1830.
		42-45.	1818-1822.	53.	1834.
8. Tineæ.....	Pls.	1-37.	1796.	68.	1823-1827.
		38-42.	1800-1805.	69.	1827.
		43-63.	1811-1817.	70.	1832.
		64-66.	1817-1818 †.	71.	1835-1841.
		67.	1818-1822.		

[Pl. 71 should be cited as 1836-41, for the date of *Moritzella*, Fisch. & Rühl. (discussed on p. 12 of Fernald), was between Easter and Michaelmas 1836, according to the "Mess-Katalog" (Wiedmann, Allgem. Verz. Bücher, &c.).]

9. Alucitæ .....	Pls.	1-2.	1804.	7.	1823.
		3-6.	1804-1818 †.		

\* Freyer, 'Neuere Beyträge,' Hft. 15, 1833, pp. 136 *seq.*, notices Hübner's work up to April 1828. This results in Papiliones, Pls. 162-187, 1823-1828; Pls. 188-195, 1828-1833.

† Charpentier, 'Verz. europ. Schmett.,' citing his set of plates, shows that the following were issued by Jan. 1818 (*i. e.* 1817):—Sphinx, pl. 30; Bombyx, pl. 63; Noctua, pl. 139; Geometra, pl. 95; Pyralis, pl. 27; Tortrix, pl. 41; Tinea, pl. 66; Alucita, pl. 6.

‡ Freyer, in his notice in 'Neuere Beyträge,' Hft. 15, 1833, pp. 136 &c., lists Hübner's work up to April 1828. This results in Nocturæ, Pls. 152-160, 1826-1828; Pls. 161-169, 1828-1833.

Herrieh-Schaeffler in 1869, in C.B. Zool. Ver. Regensburg, xxiii. pp. 173-176, 204-216, made a great effort to unravel Hübner's dates. The following is his tabulation of the Europ. Schmett. according to the information he acquired from Geyer. It is reprinted here for comparison with Fernald, but it is obvious that Fernald's list is a nearer approximation to the truth:—

1. Papilio .....	Pls. 1-113.	1798-1803.	153-181.	1818-1827.
	114-152.	1803-1818.	182-207.	1827-1841.
2. Sphinx .....	Pls. 1-19.	1797-1803.	32-35.	1818-1827.
	20-31.	1803-1818.	36-38.	1827-1841.
3. Bombyx .....	Pls. 1-52.	1800-1804.	66-69.	1818-1827.
	53-65.	1804-1818.	70-83.	1827-1841.
4. Noctua .....	Pls. 1-93.	1799-1804.	147-157.	1818-1827.
	94-146.	1804-1818.	158-185.	1827-1841.
5. Geometra ...	Pls. 1-69.	1797-1803.	99-105.	1818-1827.
	70-98.	1803-1818.	106-113.	1827-1841.
6. Pyralis .....	Pls. 1-23.	1796-1803.	30.	1818-1827.
	24-29.	1803-1818.	31-32.	1827-1841.
7. Tortrix .....	Pls. 1-30.	1796-1803.	47-48.	1818-1827.
	31-46.	1803-1818.	49-53.	1827-1841.
8. Tinea .....	Pls. 1-46.	1793-1803.	68-69.	1818-1827.
	47-67.	1803-1818.	70-71.	1827-1841.
9. Alucita .....	Pls. 1-3.	1800-1803.	4-7.	1803-1816.

1. Geschichte europ. Schmett. (Larvæ &c.) 7 vols. 4to. Augsburg. 462 pls. [1796-1841 or 1842].

We have not attempted to work out the dates of this book, as it does not concern nomenclature, but a few were given by Sherborn and Durrant in the paper referred to above.

5. Tentamen . . . stirpium Lepidopt. Single sheet, 4to, no date or place, but 1806 according to Hübner himself (Verz. bekannt. Schmett. p. 3, 1816). Zeller and Staudinger both considered the date to be 1805. See last sentence in no. 7.

[With regard to the 'Tentamen,' Zincken writes in Ersch and Gruber, Allgem. Encyclop. Sect. i. Theil 12, p. 365, 1824, article "*Breplos*":—"The above-mentioned attempt at a Lepidoptera system by Jacob Hübner of Augsburg, already frequently referred to in this Encyclopædia on similar occasions, was printed on a quarto sheet (1815) without date under the title: Tentamen [&c.]—and shows on the author's part experienced and correct views of the families, but is otherwise altogether without scientific value, since the genera are throughout arbitrarily erected and arbitrarily named, without the necessary regard to what has previously been done in the scientific world in connection with this subject." We suppose the (1815) to be a misprint for (1805).]

6. Samml. exot. Schmett. 4to. Augsburg, 1806-[1841].

Vol. I., T.p., 4 pp. of Index, 213 plates. [1806-c. 1819.]\*

Vol. II., T.p., 4 pp. of Index, 225 plates. [c. 1819-1826.]\*

Vol. III., 54 plates (known to us). [post 1826-1841.]

\* Scudder, Proc. Amer. Acad. Sci. x. 1875, p. 96.

Zutraege to above, in hundreds:—

Pp. 1-32, 8. 1818.

Pp. 1-32, 8. 1823.

Pp. 1-40, 8. 1825.

Pp. 1-48. 1832. By Geyer.

Pp. 1-52. 1837. By Geyer.

172 plates without legend of any kind beyond numerals to the figures.

It seems hopeless to attempt to date these plates; see Fernald, 1905, p. 4, for names of the first ten issued.

These are *Nereis cymo*, *Doto*, *Neso*, *Ninonia*, *Dianasa*, *Polymnia*, *Thelxiope*, *Thamar*, *Limnas Leucosia*, and *Hamadryas Amphinome* of vol. i., and were published before 15th Nov., 1806.

Plates 1-34 of vol. i. are reviewed in *Allgem. Lit. Zeit.* 19th Dec., 1807. Those who possess the "Index Exot. Lepid." (Hagen, *Bibl. Entom.* 1862, p. 389. no. 11) can fix which species of vol. ii. were issued before Dec. 1821.

Georg Semper, in *Carl Semper. Reisen Arch. Philippinen—Die Schmett. der Philipp. Inseln, Tagfalter*, p. 17. May 1886, gives a list of those plates issued before December 1821: they are 2, 11-13, 16, 24, 77, 78, 83, 90, 97, 102, 103, 108, 109, 116, 117, 122, 141, 147, 150, 164, 180, 182, 183, 195, 197, 212-214, and 223. These belong to vol. ii. Semper goes further, and on pp. 24-25 of the same work quotes 53 plates belonging to vol. iii. (von Heyden's copy in Frankfurt a. M.) as being issued between 1835 and 1838: 25 of these he is able to date to the year. Geyer refers to "vol. iii. 31 pls." (Fernald, p. 7) as being issued by Jan. 1, 1834, and Semper completes the information from v. Heyden's copy. The plates of vol. iii. are distinguished from all those of other volumes by having the locality engraven at the bottom, but they are in no sort of order, are unnumbered, and can only be referred to by name. We therefore reprint Semper's list and Grote's note in *Papilio*, iii. 1883, p. 110, noting that the undated plates must be 1834 or earlier:—

*Achillides* Bianor.

— *Hypenor*. 1838.

*Agrius* Amyntor. 1838.

*Ancyluris* Iphinoë. 1838.

*Anelia* Thirza. 1836\*.

*Anisota* Stigma. 1835.

*Anteos* Merula.

*Attacus* Atlas.

*Calaides* Polycanon.

*Caligo* Beltrao. (2 pls.) 1832.

*Catonephele* Rabena.

*Cocytius* Rustica. 1829.

*Cosmotricha* Gibbosa.

*Delias* Pasithoë. 1831.

*Doxocopa* Idylja.

*Elymnias* Casiphone. 1828.

*Erinnyis* Stheno.

*Estigmene* Lactinea. 1835.

*Eucharia* Mariamme. 1838.

*Eumæa* Debora. 1836†.

*Eunomia* Hamorrhoidalis. 1838.

*Euphœades* Garamas.

*Euproctis* argentillua.

*Gamelia* Leucane. 1838.

*Hamanumida* Lusca. 1836‡.

*Hebomoia* Glaucippe.

*Heniocha* Grimmia. 1831.

*Heraclides* Asclepias. 1829.

*Horama* Pretus.

*Hypanartia* Hippocla. 1838.

*Hyperchiria* Jo. 1830.

*Laertias* oxynius.

\* 1833; Grote, 'Papilio,' iii. 1883, p. 110.

† 1834; Grote, *ibid.*

‡ 1835; Grote, *ibid.*



Marpesia Hylas. 1836 †.  
 Mechanitis Rhezia. 1836.  
 Morphis Ehrenbergii. 1836.  
 Mylothris Linnoria.  
 — Pantoporia. 1835.  
 Nyctemera Pagenstecheri. 1836.  
 Oeneis Taygete. 1830.  
 Pharmacia Huebneri. 1838 †.  
 Priamides Osymandrias.  
 Pythonides Heremius. 1838.

Pythonides Oreus. 1838.  
 Samia Promethea.  
 Siproeta Trayja.  
 Sithon Iebus. 1838.  
 Smyrna Karwinskii. 1836.  
 Streblota Crista. 1832.  
 — Nesea. 1836 \*.  
 Trepsebrois Dioeletia. 1838.  
 Vanessa Huntera. 1828.  
 Zetides Sarpedon.

We have never seen the 24 pp. of text mentioned in Huebner and Geyer's Circulars (see Fernald, 1905, pp. 5-7), and only know the 4 pp. Index to vols. i. and ii. quoted above. But Hagen, Bibl. Entom. p. 389, says "4to Text 12 Blatt," i. e. a leaf of text to each of the first (?) 12 species.

7. Verzeichniss bekannter Schmett. 8vo. Augsburg, 1816-  
 [1826].

This is the most difficult of all Huebner's books, and has caused much labour in attempts to solve the dates correctly. We have been over the ground traversed by others, some new ground, and have approached it from a different standpoint, but can add little. The facts seem to be as follows:—

- (a) It appeared in irregular parts:—"This Verz. appears very slowly, is one of my most troublesome written works, but will be completed in 1825" (Huebner, Lepidopt. Zutraege, 1820, p. 14).

There is a break in the printing at pp. 240-241, sign. 15-16 (note the 2's).

Huebner says that "18 Bogen" (288 pp.) were on sale in 1825 (see no. 10 *infra*, Franck's Catal.).

There is a break in the printing at pp. 304-305 (sign. 19-20) (note the 3's).

- (b) It was complete in 1826. The review in 'Isis,' xx., Jan. 1827, p. 103, proves this, for the complete classification used by Huebner is given.

We are therefore able to tabulate the issue of the "Verz." as follows:—

Pp. 1-16.	1816.	
17-80.	1818.	<i>Fide</i> Scudder.
[81-160].	[1820.]	"Very slowly," Huebner.
[161-240].	[1822.]	Break in printing.
241-288.	1825.	<i>Fide</i> Huebner in Franck.
289-304.	1825.	Break in printing.

[The Exot. Schmett. Zutraege, iii. p. 33, quotes no. 2652 on p. 270 of the "Verz," and on p. 34 quotes no. 2850 on p. 294. As the Preface to this "Zutraege" was dated 27th Aug., 1825, we may assume that the whole of pp. 241-304 were out before that date.]

305-432. 1826.  
 Anzeiger. 1827.

The pp. 81-160 and 161-240 are pure speculation, but will be used in Sherborn's 'Index Animalium' until better information is forthcoming, as "me judice." We have not much doubt as to the accuracy of the other dates.

It is a remarkable thing that the "Verz." was apparently unknown to contemporary authors. The long critical review of Ochsenheimer's work by Zincken in the *Allgem. Liter. Zeitung*, 1817, makes no mention of the "Verz.," although it discusses the order of the genera and mentions Huebner many times. Nor is there any mention of Huebner's works in the *Allgem. Liter. Zeitung* from 1816-1830, though its comprehensive nature is shown by reviews of the other two authors named Huebner, writing at the same time. It is true that his works were probably published by subscription, but even so one would have expected a review if only for advertisement. Treitschke's first reference to the "Verz." occurs in his vol. vi. (2) 1828, p. 72, but this proves nothing, as he may not have approved of Huebner's weird style. Geyer's statement in Huebner, *Zuträge z. exot. Schmett.* iv. 1832, p. 5, that the "Verz." appeared in 1806, may be dismissed as an error for the "Tentamen" (Durrant *in lit.*).

8. *Lepidopt. Zuträge.* 8vo. Augsburg, 1820.

This very rare tract consists of 40 pp.\*, and was never completed. The British Museum (*Nat. Hist.*) copy was Zeller's, was purchased by Prof. Aurivillius from Friedlaender, and generously ceded by him to the Museum at the request of Mr. L. B. Prout. It contains a note on the "Tentamen" (p. 9), which seems to show that it was a separately issued sheet of tentative classification, and a note on the "Verz." saying that it appeared very slowly, was one of his most troublesome written works, but would be completed in 1825 (p. 14).

9. *Syst.-alph. Verzeichniss.* 8vo. Augsburg, 1822. 81 pp.

10. *Catal. Lépidopt. . . coll. de feu Mr. Franck.* 8vo. Strassbourg, [1826]. Pp. 102.

Huebner worked on his friend's collection from Sept. to Dec. 1825 (Geyer in *Thon. Archiv*, i. (1) 1827, p. 299). The chief value of this publication is that on p. 100 Huebner states that "18 Bogen," *i. e.* 288 pp., of the "Verz." were then on sale (*i. e.* in 1825, when he was writing).

11. *Anzeiger der in Verz. bekannter Schmett. . .* 8vo. [Augsburg, 1827.] 72 pp.

This is usually bound up with the "Verz.," to which it is an Index.

\* *Fide* 'Isis,' xviii. p. 237; Hagen's and the B. M. (N. H.) copy both end at p. 32; see also Freyer, 'Neue Beiträge,' Heft 15, 1833, p. 140.

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

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[XVI.—*Descriptions of new Genera and Species of Oriental Homoptera.* By W. L. DISTANT.

### Family Cicadidæ.

#### *Platypleura atkinsoni*, sp. n.

♀. Body above cinnamomeous brown; vertex narrowly at inner margins of eyes, and narrow anterior margins of vertex and front, piceous or black; ocelli narrowly margined with black; pronotum with the lateral and posterior margins and the anterior marginal area ochraceous, and with a more or less distinct piceous central fascia; mesonotum with two obconical spots on anterior margin and a sublateral line on each side black, the basal cruciform elevation ochraceous; posterior abdominal segmental margins distinctly paler; body beneath and legs cinnamomeous brown, the sternum and legs distinctly pilose; head beneath with a transverse black fascia between the eyes crossing anterior margin of face; tegmina and wings hyaline, the venation ochraceous; tegmina with the costal membrane and extreme base ochraceous, the whole tegminal area somewhat sparsely speckled with small but distinct black spots, those on the apical marginal area in two series arranged in pairs, the outermost smaller; face with the margins a little convex, the lateral transverse ridges strongly pronounced, the central longitudinal sulcation broad; head (including eyes) a little wider than base of

mesonotum; pronotal margins subtruncate, not medially angulate; rostrum distinctly passing posterior coxæ.

Long., excl. tegm., ♀ 15½ mm.; exp. tegm. 49 mm.

Hab. Tenasserim (Atkinson Coll., Brit. Mus.).

By the subtruncate pronotal margins allied to *P. cervina*, Walk., by the finely spotted tegmina having affinity with the S. African *P. longula*, Dist.

*Tanna bhutanensis*, sp. n.

Head, pronotum, and mesonotum more or less greenish ochraceous; anterior and lateral margins of front, an irregular central fascia to vertex (enclosing the ocelli), anterior inner margins of eyes, a curved fasciate line about middle of lateral margins and the anterior angles, anterior margin of pronotum, two central fasciate lines widened anteriorly and posteriorly, and the outer fissures, mesonotum with a short central line almost united with an elongate sagittiform spot on basal area, two irregular slightly curved discal fasciæ scarcely extending behind middle, a broad sublateral fascia on each side doubly united to the lateral margin posteriorly, and a rounded spot at each anterior angle of the cruciform elevation, black; abdomen brownish ochraceous, the segmental incisures a little darker, apex of abdomen beneath black; body beneath and legs brownish ochraceous, the face and opercula distinctly paler; tegmina and wings hyaline, the venation brownish; tegmina with the costal membrane, spots at the apices of the ulnar areas, and smaller spots near the apices of the veins to apical areas, fuscous brown; second ventral segment in male alone provided with lateral tubercles; opercula in male short, not passing posterior margin of first ventral segment, widely separated at their inner margins, which are roundly obtusely angulate, their posterior margins rounded, their lateral margins almost straight; rostrum slightly passing the posterior coxæ.

Long., excl. tegm., ♂ 24 mm.; exp. tegm. 72 mm.

Hab. Bhutan (Brit. Mus.).

The first species of this genus at present recorded from British India.

*Platylomia brevis*, sp. n.

Closely allied in colour and markings to *P. saturata*, Walk., but differing by the short and narrower opercula, which do not reach the penultimate abdominal segment as in Walker's species, but scarcely pass the posterior margin of



the third segment, their apices as in *P. saturata* are narrowed, angulated and slightly directed outwardly.

Long., excl. tegm., 40 mm.; exp. tegm. 103 mm.

Hab. "N. India" (Brit. Mus.).

*Platylomia insignis*, sp. n.

In colour and markings scarcely separable from *P. saturata*, Walk., but differing altogether in the structure of the opercula, which reach the penultimate abdominal segment, but have not their apices narrowed and angulated as in Walker's species, but somewhat broadly convexly rounded, they are narrowed at base and strongly concavely sinuate before middle of the lateral margins; the abdomen is distinctly shorter and broader, and the tegmina less arched on costal margin.

Long., excl. tegm., 36 mm.; exp. tegm. 109 mm.

Hab. Bhutan (Brit. Mus.).

*Terpnosia jenkinsi*, sp. n.

Body above brownish ochraceous, somewhat thickly and irregularly marked with black; head with the front transversely blackly striate and with two angulate black spots at base, vertex with the area of the ocelli, broad inner margins to eyes, and irregular discal spots black; pronotum with the margins of an irregular central fascia, the fissures, lateral margins, and some scattered spots black; mesonotum with a large central macular patch, a sublateral fascia and some lateral spots, some smaller spots on anterior margin, and the space between the anterior angles of the basal cruciform elevation black; abdomen above irregularly and mostly transversely marked with black; body beneath and legs dull pale ochraceous; between face and eyes a black transverse spot, face distinctly blackly striate; apex of rostrum, shadings to anterior and intermediate femora, apices of tibiae and tarsi, black; abdominal segments beneath transversely and maculately shaded with fuscous brown; tegmina and wings hyaline, the first with the venation shaded here and there with black, two transverse linear spots before apex, the apex of the second ulnar area, and small indistinct spots near the apices of the longitudinal veins to apical areas, black or blackish; tympanal coverings only a little shorter, but considerably narrower, than tympanal orifices; opercula in male not extending beyond base of abdomen, their lateral margins sinuate, their apices transversely rounded; rostrum reaching the posterior coxæ; wings with six apical areas.

Long., excl. tegm., ♂ 26 mm.; exp. tegm. 72 mm.

*Hab.* W. Bengal; Paresnath (*J. T. Jenkins*, Brit. and Ind. Muss.).

This species, of which I have as yet seen only two specimens, is allied to *P. pscoa*, Walk., by the length of the tympanal coverings; it is, however, a smaller and differently marked species. The most distinct, but possibly abnormal, character in the type of *P. jenkinsi* is found in the tegmina, where there is a distinct cell before the second apical area; the relative lengths of this cell and apical area are not quite similar in the two tegmina.

### Fam. Fulgoridæ.

#### Subfam. *TROPIDUCHINÆ*.

#### *EILITHYIA*, gen. nov.

Vertex subquadrate, the margins strongly ridged, its apex somewhat moderately angularly rounded; eyes longer than broad, posteriorly projecting over the anterior angles of the pronotum; face longer than broad, lateral margins ridged, a little concave, moderately widened and angulate before clypeus, centrally strongly carinate, the carination bifurcate anteriorly; clypeus strongly centrally carinate, its lateral margins not carinate; pronotum strongly convex anteriorly, concave posteriorly, centrally strongly carinate, its lateral angles posteriorly subacute, anterior margin distinctly carinate; mesonotum tricarinate; posterior tibiæ with two spines, one before and the other behind middle; tegmina about two and a half times as long as broad, costal margin convexly rounded, apex conically rounded, costal membrane broad, not veined, three longitudinal cells from base to beyond middle, beyond which the venation is close and longitudinal and where a series of transverse veins delimitates a close series of apical and antepical cells, claval vein extending to about middle of claval area; wings shorter but scarcely broader than tegmina, posterior margin strongly sinuate, a series of disconnected transverse veins before apical area.

Somewhat allied to *Tumbinia*, from which it differs in the shape of vertex and face, and in the position of the longitudinal veins to tegmina, the first not being near costal margin as in *Tambinia*.

#### *Eilithyia insularis*, sp. n.

Body and legs ochraceous; tegmina very pale ochraceous;

wings hyaline with the venation pale ochraceous; abdomen with the spiracles very distinct, centrally dorsally ridged; anal appendage in female long, slender, apically bifurcate; other characters as in generic diagnosis.

Long., excl. tegm., ♀  $7\frac{1}{2}$  mm.; exp. tegm. 17 mm.

*Hab.* Narkondam Island.

*Epora montana*, sp. n.

Body and legs ochraceous; tegmina pale ochraceous; wings hyaline with the veins pale ochraceous; vertex of head with a distinct central longitudinal ridge; face elongate, centrally and longitudinally ridged; tegmina with the costal membrane somewhat closely, obliquely, transversely veined, apical and subapical elongate narrow cells, the apical cells the longer of the two.

Long., excl. tegm., 8 mm.; exp. tegm. 17 mm.

*Hab.* Nilgiri Hills (*Hampson*).

Allied to *E. subtilis*, Walk., but readily distinguished from that species by the size and shape of the apical and subapical cells to the tegmina.

ANTABHOGA, gen. nov.

Head (including eyes) narrower than pronotum, vertex very short and broad, conically rounded in front, the anterior margin strongly upwardly ridged, finely centrally carinate; face longer than broad, a little widened towards clypeus, both strongly centrally carinate, lateral margins of face upwardly ridged; pronotum a little longer than vertex, posterior margin strongly subangularly emarginate, distinctly centrally carinate, anterior margin carinately ridged; mesonotum longer than vertex and pronotum together, centrally tricarinate, the lateral carinations united anteriorly; abdomen moderately broad and short; posterior tibiae with three spines; tegmina about or nearly three times as long as broad, costal membrane with numerous oblique veins, a transverse, rounded series of subapical veins enclosing short apical cells, and a nearly straight series of transverse veins beyond middle enclosing narrow elongate subapical cells.

Allied to *Epora*, Walk., but differing in the structure of the face and vertex and in the arrangement of the cells to the tegmina.

*Antabhoga gardineri*, sp. n.

Almost uniformly brownish ochraceous; wings fuliginous; the carinations and carinate margins to the head and thorax

above in places distinctly paler; extreme costal and apical margins of tegmina ochraceous, the apical area also slightly mottled with ochraceous; legs ochraceous; other characters as in generic diagnosis.

Long., incl. tegm., 7-8 mm.

*Hab.* Laccadive Islands; Minikoi (*Gardiner*, Brit. Mus.).

Subfam. *ACHILINÆ*.

*DEFERUNDA*, gen. nov.

Vertex of head longer than breadth between eyes, prominently produced in front of eyes, slightly upturned apically, the lateral margins distinctly upturned, the disk depressed; face much longer than broad, distinctly produced before eyes, centrally and laterally carinate, distinctly foveate anteriorly; clypeus small, about half the length of face, the margins distinctly carinate; pronotum narrow, centrally tricarinate, the lateral angles moderately ampliate; mesonotum broad, tricarinate, considerably broader than long, the lateral angles subacute; abdomen broad, moderately robust; posterior tibiæ unspined; tegmina about three times as long as broad, moderately angulate and then ampliate beyond clavus, claval vein about reaching claval apex, a distinct series of apical cells, beyond clavus a distinct subquadrate cell, above and beyond which are a cluster of anteapical cells; wings much broader and a little shorter than tegmina.

A genus to be placed near *Faventia*, Stål, by the face distinctly produced before eyes and the small clypeus.

*Deferunda stigmatica*, sp. n.

Vertex and pronotum greyish white, the first with longitudinal black lines; mesonotum with three irregular transverse fasciæ, one at anterior margin, one near middle, and the third, which is strongly waved, behind middle; abdomen above piceous; face and clypeus greyish white, the former with a transverse sinuate black fascia before middle; sternum and legs more or less ochraceous; abdomen beneath blackish, with the margins of the segments greyish white; tegmina with the basal two-thirds more or less ochraceous, the apical third greyish, the veins more or less minutely spotted or granulated with black, much less prominently so on apical third, a distinct carmine-red stigmatal spot, interiorly margined with black; wings fuliginous.

Long., excl. tegm., 4 mm.; exp. tegm. 9 mm.

*Hab.* Bengal; Chapra (*Mackenzie*, Brit. Mus.).



*Kinnara maculata*, sp. n.

Body above more or less castaneous brown; apex of the abdomen pale ochraceous; body beneath and legs, vertex and pronotum, more or less ochraceous; tegmina very pale ochraceous, subhyaline, with three prominent fuscous spots, one near base, another near end of subcostal area, and the third on disk a little beyond and above the apex of clavus, the apical marginal area distinctly palely infusate; wings hyaline, the veins palely fuscous, the anal posterior area adorned with opaline lustre.

Long., excl. tegm.,  $2\frac{1}{2}$  mm.; exp. tegm.  $9\frac{1}{2}$ –10 mm.

*Hab.* Travancore; Maddathoray, west base of W. Ghats (*Annandale*, Indian and Brit. Mus.).

This species differs from *K. ceylonica*, Melich., in the narrower face, different colour and markings.

*Kinnara spectra*, sp. n.

Body and legs pale ochraceous; tegmina and wings subhyaline, uniformly greyish white; vertex short and broad, much narrower than pronotum, the disk concave, the margins strongly carinate; face narrowest between the eyes, amplified towards middle where it is subangulate, and then narrowed to clypeus.

Long., excl. tegm., 3 mm.; exp. tegm. 11 mm.

*Hab.* E. Himalayas (Brit. Mus.).

This species is to be separated from all the other species of the genus at present described by the uniformly pale and subhyaline tegmina and wings, and the subangulate amplification of the face.

## AMBALANGODA, gen. nov.

Vertex very slightly longer than broad, the lateral margins laminately raised and slightly projecting at their apices; eyes elongate, occupying the whole lateral margins of the vertex and continued backward beyond its base; face longer than broad, widened toward clypeus, the lateral margins sinuate and ampliately ridged, centrally longitudinally carinate, before clypeus moderately concave; clypeus a little more than half the length of face, its lateral margins carinate, its disk somewhat tumid; pronotum very narrow, its lateral areas strongly obliquely recurved backward; mesonotum large, with the disk longitudinally raised, flattened and tricarinate; posterior tibiae not spined; tegmina more than twice as long as broad, widened toward apex, costal margin

distinctly sinuate near base, two transverse veins near middle, five or six anteapical cells separated from the apical cells by a curved series of transverse veins, the apical cells moderately long and narrow, the uppermost, before apex, oblique; wings a little shorter than tegmina, slightly more than twice as long as broad, two transverse veins near middle and a short angulate apical cell.

By the face slightly projecting before eyes and the short clypeus, this genus is allied to *Kosalya*, Dist., from which it differs by the totally different structure of the face and the non-spined posterior tibiae.

*Ambalangoda insignis*, sp. n.

Vertex and pronotum ochraceous, mesonotum piceous with the longitudinal carinate disk ochraceous; abdomen piceous or black; face black, the ampliate margins brownish ochraceous and somewhat darkly maculate; clypeus brownish ochraceous, the margins darkly maculate near base and apex; sternum and legs dull ochraceous and more or less darkly maculate; tegmina for about half the length dull ochraceous with the veins darker, the whole apical area more dull greyish with a broad and ill-defined slightly curved fuscous fascia near the apical margin, the veins to the three upper subapical cells distinctly infuscated at the apices, clavus white with some black spots at its upper margin and another at its apex; wings very pale fuliginous with the veins darker. Structural characters as in generic diagnosis.

Long., excl. tegm., 3 mm.; exp. tegm. 9 mm.

*Hab.* Ceylon; *Ambalangoda* (*Green*).

Subfam. *LOPHOPINÆ*.

*Pitambara montana*, sp. n.

Vertex very pale flavescent, the margins and two small spots at base brownish testaceous; pronotum flavescent, with a sublateral piceous spot on each side; mesonotum black, its apex flavescent; abdomen above piceous, the basal area and narrow segmental margins flavescent; body beneath and legs ochraceous, femora more or less annulated with piceous; tegmina hyaline, largely marked and suffused with piceous, the principal features of which are the basal area, a large spot before end of clavus and about apical third, the latter is oblique, and does not reach the apex or apical margin, to the first of which it is connected by two oblique stripes, the costal membrane is also obliquely, transversely, fasciately

marked with piceous; wings fuliginous; vertex with the lateral margins strongly ridged, moderately produced in front of eyes; face much longer than broad, posteriorly strongly angularly amplified, its lateral margins (except on posterior area) laminately dilated and with two carinae on each of their under surfaces; clypeus centrally and laterally carinate; posterior tibiae with a single spine.

Long.  $4\frac{1}{2}$  mm.; exp. tegm. 13 mm.

*Hab.* Lower Burma; Dawna Hills (*Annandale*).

A single specimen captured by Dr. N. Annandale.

*Pitambara dawnana*, sp. n.

Vertex greyish white with two minute brownish spots at base, eyes brownish; pronotum black, a central line and the lateral areas greyish white; mesonotum black, its lateral angles greyish white; body beneath and legs very pale ochraceous, abdominal segmental margins greyish white; tegmina pitchy brown; costal membrane, a very large ovate spot near middle, inwardly almost reaching clavus, and the apical margin greyish white, subhyaline, the costal membrane at basal area and before apex is transversely spotted with pitchy brown and the brown area beyond middle is obscurely spotted with greyish; wings greyish white, subhyaline; face prominently angulated on each side before clypeus, with a very fine central carinate line and two ridges on the lateral areas; clypeus tricarinate; vertex moderately produced in front of eyes, its lateral margins ridged; mesonotum distinctly tricarinate.

Long., incl. tegm., 7 mm.

*Hab.* Lower Burma; Dawna Hills (*Annandale*).

I have only seen a single specimen of this species.

*Serida sherwilli*, sp. n.

Closely allied to the type of the genus *S. latens*, Walk.\*, but differing by the two central carinations to the face being less parallel and more divergent posteriorly, the wings more uniformly and darkly fuliginous, the tegmina with the apical marginal area without the linear angulated dark lines which are replaced by a continuous, irregularly waved transverse fascia, and the surrounding markings of a darker, larger, and more distinct character.

Long., excl. tegm.,  $7\frac{1}{2}$  mm.; exp. tegm. 21 mm.

*Hab.* Sylhet, Chandkhira (*Sherwill*).

This is the Western form of the genus; *S. latens* is at present not known further west than Tenasserim.

\* Cf. Faun. Brit. Ind., Rhynch. iii. p. 325, fig. 160 (1906).

Subfam. *DELPHACINÆ*.*Pundaluoya insignis*, sp. n.

Head, pronotum, and mesonotum ochraceous, lateral areas of pro- and mesonota black; abdomen above black, lateral margins more or less minutely spotted with testaceous; body beneath black; legs pale testaceous, femora and apices of tibiae mostly black; tegmina subhyaline, more than basal half brownish ochraceous where the veins are brownly granulose, apical area piceous, with a large stigmatal triangular spot above and a marginal series of smaller spots, greyish white; wings hyaline, the veins fuscous; vertex short, broad, marginally and centrally carinate, the anterior margin almost in a line with the anterior margins of the eyes; face sometimes distinctly bicolorous, then between the eyes being castaneous, tricarinate.

Long., excl. tegm., 3-3½ mm.; exp. tegm. 9-10 mm.

*Hab.* Bengal; Pusa (Brit. Mus.). Balighai, near Puri, Orissa (Ind. Mus.). Bombay, Bassein Fort (Brit. Mus.).

At Pusa it is recorded as taken on wheat, at light, and in jungle; a single specimen was taken by Dr. Annandale in Orissa.

*Pundaluoya pulchella*, sp. n.

Body above black; vertex much suffused with ochraceous; ridges to pro- and mesonota ochraceous; abdomen spotted on each side near base with ochraceous; body beneath and legs black; face more or less speckled with ochraceous, the central and lateral carinations, the apex and cheeks also ochraceous; basal margin of clypeus ochraceous; legs more or less streaked with ochraceous; tegmina hyaline, veins rather thickly speckled with fuscous granules, a curved fascia extending from stigma to posterior angle and then upwardly recurved to near apex, two short oblique fasciæ beyond stigma and a marginal line near apex of clavus, fuscous; wings hyaline, the veins darker; face with the central carination bifurcating at a little beyond middle.

*Var.* Head, pronotum, and mesonotum castaneous, not black.

Long., excl. tegm., 2½ mm.; exp. tegm. 10 mm.

*Hab.* Ceylon; Peradeniya and Trincomalee (*Green*, Brit. Mus.). Bengal; Pusa (*H. L. D.*), Chapra (*Mackenzie*, Brit. Mus.); Travancore; Temalai, W. Ghats (*Annandale*, Ind. Mus.); Bombay; Bassein Fort (Brit. Mus.).



*Pundaluoya facialis*, sp. n.

Vertex, pronotum, and mesonotum ochraceous; abdomen above black, more or less annulated with ochraceous; face ochraceous, castaneous between the eyes, clypeus black; cheeks ochraceous, spotted with black; sternum and legs ochraceous; abdomen beneath fuscous brown, a central fascia and lateral spots ochraceous; tegmina hyaline, the veins rather thickly speckled with fuscous, a curved longitudinal fascia extending from the apices of the longitudinal veins to apex, two short oblique fasciæ beyond stigma, apical spots at terminations of apical veins, and a marginal line near apex of clavus, fuscous.

Long., excl. tegm.,  $2\frac{1}{2}$  mm.; exp. tegm.  $9\frac{1}{2}$  mm.

Hab. Bengal; Chapra (*Mackenzie*, Brit. Mus.).

By the markings of the tegmina allied to *P. simplicia*, Dist., but differing from that species by the speckled venation, &c.

*Sogata pusana*, sp. n.

Vertex, pronotum, and mesonotum ochraceous, the lateral areas of the pro- and mesonota more or less piceous; abdomen above black, more or less transversely testaceous near base and the lateral margins minutely spotted with the same colour, face black with the carinations brownish ochraceous; clypeus ochraceous; body beneath blackish, the legs ochraceous; tegmina pale brownish, subhyaline, an upper claval streak becoming macular at claval apex, a transverse linear discal spot beyond middle, and a subapical marginal suffusion continued along the veins to apical margin, fuscous; wings hyaline, the veins fuscous; posterior tibiæ with a short spine near middle and a long apical mobile spur; wings broader but shorter than tegmina, with a short triangular cell near apex.

Long., excl. tegm., 3 mm.; exp. tegm. 7 mm.

Hab. Bengal; Pusa (*Lefroy*, Brit. Mus.), Calcutta; Berhampur, Murshidabad District.

Some examples from Calcutta are much paler in hue, the face being almost uniformly ochraceous, and the dark markings of the tegmina more obsolete.

*Sogata distincta*, sp. n.

Vertex and pronotum creamy white, the first with a small dark spot on each side of apex; mesonotum black, broadly, longitudinally, centrally creamy white; abdomen above

black, the basal area more or less testaceous; body beneath black, the carinations to face and clypeus, and the legs, ochraceous; tegmina subhyaline, tinted with brownish ochraceous, which becomes a little darker on apical area, the outer margin of which is broadly fuscous, inwardly linearly connected with the apices of the longitudinal veins, the longitudinal veins minutely spotted with fuscous, an elongate marginal piceous spot near apex of clavus; wings subhyaline, the veins dark.

Long., excl. tegm.,  $2\frac{1}{2}$  mm.; exp. tegm., 7 mm.

Hab. Bengal; Pusa (*Mackenzie*, Brit. Mus.).

Allied to the preceding *S. pusana*, from which it differs in the distinct markings of the tegmina, &c.

*Sogata pallescens*, sp. n.

Allied to the preceding species *S. distincta*, but with the tegmina—excepting an elongate marginal piceous spot near apex of clavus—almost uniformly subhyaline with the veins alone darker; body beneath black; carinations to face, the clypeus, lateral areas of prosternum, rostrum and legs ochraceous.

Long., incl. tegm.,  $3\frac{1}{2}$  mm.

Hab. Ceylon; Galle (*Fletcher*, Brit. Mus.). Bengal; Chapra (*Mackenzie*, Brit. Mus.); between Bolpore and Rampore Haut (*Paiva*, Ind. Mus.). Calcutta.

The three species of *Sogata* here described are easily separated by the tegminal colour and markings, but it is much more difficult in these small and fragile insects to discover adequate differential structural characters. I have, however, examined a series of specimens belonging to each species and the characters on which I have relied are quite constant.

*Orchesma signata*, sp. n.

Vertex, pronotum, and mesonotum ochraceous, centrally and laterally carinate, the carinations more or less pale and narrowly margined on each side with black; abdomen above testaceous red; body beneath and legs pale ochraceous, face and lateral margins of abdomen beneath testaceous red; tegmina pale shining ochraceous, with the following creamy-white markings, viz., an oblique transverse fascia near base, a transverse fascia a little beyond middle, three fasciate costal spots between stigma and apex, two small spots on apical margin and another beyond claval apex, near middle and on the central pale fascia two longitudinal black spots

thickly studded with ochraceous; wings hyaline, the transverse veins distinctly black; face centrally and laterally carinate, the margins moderately roundly ampliate near middle; tegmina with the costal margin distinctly sinuate.

Long., excl. tegm.,  $2\frac{1}{2}$  mm.; exp. tegm., 8 mm.

Hab. Ceylon; Peradeniya (Green, Brit. Mus.).

*Tropidocephala luteola*, sp. n.

Head, pronotum, and mesonotum greenish ochraceous, lateral areas of the pro- and mesonota more or less infuscated, sometimes scarcely so; antennæ black; abdomen above black, the basal area more or less transversely testaceous; body beneath black; face brownish ochraceous, the carinations paler; legs ochraceous; tegmina pale fuscous brown irrorated with greyish white, the principal pale markings being an elongate spot in clavus, an irregular transverse macular fascia near middle, commencing on costal margin and becoming more macular and indistinct towards the inner margin, a cluster of about three spots on costal membrane immediately beyond the transverse fascia, and distinct apical marginal spots; wings hyaline with the veins darker; vertex longer than broad, considerably shorter than breadth between outer margins of eyes and only moderately projecting in front of eyes, distinctly, strongly tricarinate; pro- and mesonota strongly tricarinate; face tricarinate, projecting considerably above eyes, greatest width about half its length.

Long., excl. tegm., 2 mm.; exp. tegm. 6 mm.

Hab. Bengal; Pusa (Lefroy, Brit. Mus.). Calcutta (Ind. Mus.).

A species to be distinguished by the very short vertex of the head.

ZULEIKA, gen. nov.

Vertex narrow, nearly twice as long as broad, the lateral margins carinate and from which emerge two short oblique carinations between the eyes which converge at apex; eyes longer than broad, continued over the anterior pronotal angles; pronotum short, tricarinate, the lateral angles somewhat ampliate; mesonotum about as long as vertex and pronotum together, tricarinate; face long, about twice as long as broad, a little widened towards clypeus, the lateral margins straight, slightly oblique, distinctly carinate and slightly recurved, centrally strongly carinate, the anterior margin with the apical angles somewhat prominent; clypeus a little more than half as long as face, the disk tumid, the

lateral margins carinately recurved; tegmina not reaching the apex of the abdomen, apical margins rounded, venation very coarse and distinct; posterior tibiae somewhat long, with a spine near base and another near middle, apex with a long, strong, mobile spur.

In my Indian enumeration, *Zuleika* will find a place near *Dieranotropis*, Fieb.

*Zuleika bengalensis*, sp. n.

Head, pronotum, and mesonotum ochraceous; eyes, face, and clypeus black; body beneath and legs, and abdomen above, ochraceous; tegmina with a slightly virescent tint, inner and apical margins pale ochraceous, the apical margin and a spot near middle of inner margin black; structural characters as in generic diagnosis.

Long.  $3\frac{1}{2}$  mm.

*Hab.* Calcutta (Brit. Mus.).

XVII.—*Notes on Fossorial Hymenoptera*.—VI.

By ROWLAND E. TURNER, F.Z.S., F.E.S.

*On the Species collected in New Guinea by the Expedition of the British Ornithologists' Union.*

THE species enumerated in this paper were collected by Dr. A. F. R. Wollaston on the expedition sent by the British Ornithologists' Union to S.W. New Guinea. Of the twenty species collected five appear to be new to science.

Family Mutillidæ.

1. *Mutilla nigra*, Sm.

*Mutilla nigra*, Sm. Journ. Proc. Linn. Soc., Zool. iii. p. 151 (1858). ♂.

*Hab.* Mimika River; 2 ♂♂.

This male is somewhat allied to *M. oceanica*, André, and belongs to the typical *Mutilla* section of the family, not to *Ephutomorpha*. It is also recorded from Aru.

Family Scoliidæ.

Subfamily SCOLIINÆ.

2. *Scolia (Discolia) nitida*, Sm.

*Scolia nitida*, Sm. Journ. Proc. Linn. Soc., Zool. iii. p. 152 (1858). ♀.

*Hab.* Mimika River; 1 ♀. Wataikwa River; 3 ♂♂.

This species is common in New Guinea and Aru.



3. *Scolia (Dielis)* sp.

*Hab.* Wataikwa River; 5 ♂♂.

Probably a new species, but it is not in the interests of science to describe species of this section from males.

Family *Psammocharidæ* (olim *Pompilidæ*).

4. *Hemipepsis ferruginea*, Sm.

*Mygimnia ferruginea*, Sm. Journ. Proc. Linn. Soc., Zool. iv. Suppl. p. 121 (1860). ♀.

*Hab.* Mimika River; 1 ♀.

5. *Hemipepsis indicus*, Cam.

*Salix (Mygimnia) indicus*, Cam. Mem. Manchester Lit. & Phil. Soc. (4) iv. p. 448 (1891).

*Hab.* Mimika River; 1 ♀, July.

This species seems to have been confused by Smith with his *Mygimnia ferrida* from Celebes, which has the antennæ more slender especially at the base, the second joint of the flagellum rather shorter, and the median segment less coarsely striated and without lateral tubercles.

The range of *H. indicus* extends to N.E. India.

6. *Pseudagenia adusta*, Sm.

*Priocnemis adustus*, Sm. Journ. Proc. Linn. Soc., Zool. vii. p. 30 (1863). ♂.

*Hab.* Mimika River; July, 1 ♀.

One specimen, which I refer with doubt to this species; I have not seen Smith's type.

The female has the clypeus produced into a short tooth in the middle of the apical margin, which is slightly sinuate on each side of the tooth and rounded at the sides. Second joint of the flagellum almost as long as the third and fourth combined. Eyes separated on the vertex by a distance equal to the length of the third joint of the flagellum plus one-third of the fourth joint; the posterior ocelli nearer to each other than to the eyes. Median segment strongly transversely striated posteriorly, with a faint median sulcus and a broad longitudinal depression on each side, as long as broad. Petiole occupying about one-third of the length of the first abdominal segment; sixth segment opaque at the base, an apical area not occupying quite the whole breadth of the segment smooth and shining, this area projecting into the opaque basal portion beyond the middle of the segment.

Third abscissa of the radius distinctly longer than the second; first recurrent nervure received before two-thirds from the base of the second cubital cell, second at one-sixth from the base of the third cubital cell. Submedian cell a little longer than the median; cubitus of hind wing originating beyond the transverse median nervure. Hind tibiae slightly spinose. Transverse groove on the second ventral segment very distinct.

Ferruginous; the wings flavo-hyaline at the base and apex, the fore wings with a light fusco-violaceous cloud from the basal nervure to the apex of the radial cell.

Length 17 mm.

#### 7. *Pseudagenia pulcherrima*, Sm.

*Priocnemis pulcherrimus*, Sm. Journ. Proc. Linn. Soc., Zool. iii. p. 156 (1858). ♀.

*Salix pulcherrimus*, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. p. 45 (1884).

*Hab.* Mimika River; August 1910, 1 ♀.

Also from Aru.

#### 8. *Pseudagenia amalthea*, Sm.

*Pompilus (Agenia) amalthea*, Sm. Journ. Proc. Linn. Soc., Zool. iii. p. 155 (1858). ♀.

*Pseudagenia amalthea*, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. p. 42 (1884).

*Hab.* Mimika River; 1 ♀, July 1910.

Also from Aru.

### Family Sphegidae (sensu lato).

#### 9. *Sceliphron fervens*, Sm.

*Pelopæus fervens*, Sm. Journ. Proc. Linn. Soc., Zool. ii. p. 101 (1857). ♀.

*Hab.* Mimika River; 5 ♀ ♀, June–August.

Described by Smith from Borneo. The colour is variable, but specimens from Borneo seem to have the abdomen less strongly suffused with black than in those from New Guinea. I suspect that the New Guinea form is identical with *murarius*, Sm., from Ceram; but if so, Smith's statement that the petiole is shorter in *murarius* must be erroneous.

10. *Sphex staudingeri*, Grib.

*Sphex staudingeri*, Grib. *Miscell. Entom.* ii. 1, p. 2 (1894). ♂. Kohl, *Ann. Hofmus. Wien*, x. p. 69 (1895). ♂ ♀.

*Hab.* Wataikwa River; August 1910, 2 ♀.

I have some doubt as to the correctness of my identification of these specimens. They agree fairly with Kohl's description in structural points, but the longitudinal groove on the scutellum is very faint. The abdomen is black, with the exception of the sixth segment, the apex of the fifth and the apex of first ventral segment.

11. *Sphex umbrosus*, Christ.

*Sphex umbrosa*, Christ, *Naturg. d. Insect.* p. 293 (1791).

*Hab.* Wataikwa River; August 1910, 1 ♀.

One specimen of this wide-ranging species.

12. *Sphex (Isodontia) aurifrons*, Sm.

*Sphex aurifrons*, Sm. *Journ. Proc. Linn. Soc., Zool.* iii. p. 157 (1858). ♀.

*Hab.* Wataikwa River; September 1910, 1 ♀.

Identical with the typical form from Aru. I consider that *abditus*, Kohl, is merely a local form of this species, which ranges from India to N. Queensland.

13. *Sphex (Isodontia) praslinius*, Guér.

*Sphex praslinius*, Guér. *Voy. 'Coquille,' Zool.* ii. p. 262 (1839).

*Sphex (Isodontia) praslinius*, Kohl, *Ann. Hofmus. Wien*, v. p. 386 (1890).

*Hab.* Wataikwa River; August 1910, 1 ♀.

Originally described from New Ireland.

14. *Sphex (Isodontia) nigellus*, Sm.

*Sphex nigella*, Sm. *Cat. Hym. B.M.* iv. p. 255 (1856).

*Hab.* Wataikwa River; 2 ♂ ♂, August.

I am doubtful if these specimens are correctly identified, the petiole being distinctly shorter and the wings darker than is usual in males of *nigellus*, which has a very wide range in Australia and E. Asia.

15. *Sphex (Isodontia) permutans*, sp. n.

♀. Nigra, aureo-pilosa, alis subhyalinis, apice infumatis; mandibulis apice bidentatis.

Long. 17 mm.

♀. Mandibles slender, bidentate at the apex; clypeus slightly emarginate at the apex, with a longitudinal carina from the base almost reaching the apex, the extreme apical margin depressed. Eyes distinctly converging towards the clypeus and also towards the vertex, leaving the inner margin curved, the distance separating them on the vertex scarcely greater than that separating them on the clypeus; posterior ocelli as far from each other as from the eyes. Second joint of the flagellum very slightly longer than the third, the fourth no longer than the third. Head, thorax, and median segment very minutely and closely punctured, clothed with pale golden pubescence on the clypeus, front, cheeks, mesopleura, pronotum, lateral and apical margins of the mesonotum, postscutellum, and sides of the median segment. Petiole almost as long as the two basal joints of the posterior tarsi combined. Second abscissa of the radius nearly half as long again as the third and a little longer than the second transverse cubital nervure. First recurrent nervure received at two-thirds from the base of the second cubital cell, second at about one-tenth from the base of the third cubital cell.

*Hab.* Wataikwa River; August, 2 ♀ ♀.

Nearly allied to *egens*, Kohl, from New Britain, which it resembles in the convergence of the eyes both towards the clypeus and the vertex. It differs, however, in the length of the fourth joint of the flagellum, which is very long in *egens*, but only of ordinary length in the present species. The male only of *egens* is described, but I do not think that this difference is sexual.

16. *Larra corrugata*, sp. n.

♂. Niger, subnitidus, segmento mediano transverse striato; alis subhyalinis, iridescentibus, dimidio apicali obscuriore.

Long. 7 mm.

♂. Mandibles deeply excised on the outer margin; clypeus broadly subtruncate at the apex and clothed with fine whitish pubescence. Second joint of the flagellum a little longer than the third, but not as long as the first and third combined, about twice as long as the breadth at the apex; the



antennæ about equal in length to the thorax and median segment combined. Eyes separated on the vertex by a distance not quite equal to the length of the second and third joints of the flagellum combined. Mesonotum finely and closely punctured, somewhat depressed in the middle of the anterior margin; median segment as broad at the base as long, moderately narrowed towards the apex, and vertically truncate, the dorsal surface coarsely transversely striated with an obscure median sulcus, the surface of the posterior truncation with a well-defined median sulcus and a few irregular striæ. Abdomen smooth and shining, segments 1-3 with an apical fascia of whitish pubescence. Tarsal ungues short. Second abscissa of the radius half as long again as the third, the first a little shorter than the second and third combined. The two recurrent nervures are nearer to each other than the first is to the base of the second cubital cell, which is about one quarter longer than the third on the cubital nervure. Third transverse cubital nervure oblique, curved slightly outwards close to the cubital nervure. Radial cell broad, more than half as broad as the length on the costa, broadly truncate at the apex, with a distinct appendiculate cell.

*Hab.* Mimika River; 2 ♂♂, July and August.

### Genus DICRANORHINA, Shuck.

*Dicranorhina*, Shuck., Lardner's Cabinet Cyclopædia, Natural History, Insects (Swainson and Shuckard, 1840).  
*Piagetia*, Rits. Ent. M. Mag. ix. p. 129 (1872).

Shuckard's name must, I think, hold good for this genus. As Mr. Distant has pointed out to me, the name is not pre-occupied in Coleoptera, Hope's genus *Dicranorhina*, 1837, having been corrected to *Dicranorrhina* by Burmeister in 1842.

#### 17. *Dicranorhina wollastoni*, sp. n.

♀. Nigra, opaca, fulvo-pilosa, abdomine nitido: pedibus anterioribus pallide testaceis; alis hyalinis, fascia lata fusca ante apicem, venis nigris.

Long. 9 mm.

♀. Clypeus short and broad, truncate at the apex, with a median longitudinal carina. Second joint of the flagellum twice as long as the first, and equal in length to the third. Eyes separated on the vertex by a distance equal to the length of the first and second joints of the flagellum com-

bined. Head, pronotum, mesopleuræ, and median segment covered with very short pale fulvous pubescence. Median segment a little longer than the breadth at the base, narrowed posteriorly, more opaque than the mesonotum, the posterior slope with a median sulcus. Abdomen smooth and shining; the basal segment scarcely as long as the second, subpetiolate, gradually widened from the base. Fifth dorsal segment and pygidial area finely and sparsely punctured. Third abscissa of the radius as long as the second, first recurrent nervure received close to the base of the second cubital cell, almost interstitial with the first transverse cubital nervure, second received beyond one-third from the base of the second cubital cell. The fuscous band is broad, commencing at the middle of the stigma and reaching to the apex of the radial cell, and is of about the same breadth throughout. Hind femora without a tubercle. Tibiæ with a few very slender spines; basal joint of anterior tarsi with four very weak spines.

*Hab.* Mimika River; July 1910, 1 ♀.

There is no iridescence on the wings except at the extreme apex.

Nearly allied to *intaminata*, Turn., from Queensland, but differs in the colour of the fore legs and in the shape of the cubital cells.

### 18. *Pison impunctatum*, sp. n.

♀. Nigra, impunctata, subopaca; alis hyalinis, iridescentibus, apice leviter obscuratis, segmento mediano carina longitudinali.

Long. 6 mm.

♀. Smooth and subopaque, the abdomen shining. Clypeus broadly rounded at the apex and covered with white pubescence. Eyes separated on the vertex by a distance scarcely exceeding the length of the second joint of the flagellum, about twice as far apart on the clypeus. Posterior ocelli touching the eyes, much nearer to each other than to the anterior ocellus. Front slightly convex, longitudinally depressed in the middle; the emargination of the eyes deep and triangular. Second and third joints of the flagellum of about equal length. Pronotum not very steeply sloped in front, the posterior margin almost transverse and level with the mesonotum. Median segment with a longitudinal sulcus from the base not quite reaching the apex, with a carina in the sulcus, the posterior truncation of the segment with a deep fovea at the base and a few short transverse striæ. Abdominal segments with a rather faint apical band of white

pubescence. Spur of the hind tibia shorter by one-third than the basal joint of the hind tarsus. Radial cell lanceolate; first abscissa of the radius twice as long as the second; recurrent nervures interstitial with the first and second transverse cubital nervures, the second recurrent nervure bent outwards near the middle; the second cubital cell small.

*Hab.* Mimika River; August 1910, 1. ♀.

Nearly allied to *P. iridipenne*, Sm., but in the present species the eyes are closer to each other on the vertex and the median segment is smooth, whereas very fine striæ are visible in *iridipenne*.

### 19. *Pison constrictum*, sp. n.

♂. Niger, dense punctatus, albo-pilosus, alis subhyalinis, venis nigris; clypeo apice dente acuto armato, fronte rugulosa, segmento mediano postice transverse striato, sulco mediano basali indistincto.

Long. 11 mm.

♂. Clypeus more than twice as broad as the greatest length, produced into an acute tooth on the middle of the apical margin, covered with delicate silvery-white pubescence. Eyes more than half as far again from each other on the clypeus as on the vertex; posterior ocelli very close together, a little nearer to each other than to the eyes and much nearer to each other than to the anterior ocellus, a shallowly impressed transverse line behind the posterior ocelli. Front rugulose, the emargination of the eyes opaque and almost smooth, a less strongly rugulose convex space divided by an indistinct longitudinal groove above the base of the antennæ; second joint of the flagellum longer than the third, but shorter than the first and third combined; vertex, thorax, and median segment finely and closely punctured, abdomen very finely punctured; a very shallow sulcus almost obsolete at the apex from the base of the median segment, the posterior truncation somewhat abrupt, the surface of the truncation irregularly transversely striated with a deep median depression from the base not quite reaching the apex. Abdominal segments moderately constricted at the base, the apical segment small and rugose, pointed at the apex. Basal joint of the posterior tarsi scarcely longer than the spine of the posterior tibiae. First abscissa of the radius about twice as long as the second, the second cubital cell very small, only occupying one-third of the length of the first transverse cubital nervure; first

recurrent nervure received by the first cubital cell close to the apex, second by the third cubital cell at the extreme base.

*Hab.* Mimika River; 1 ♂, July 1910.

Somewhat allied to *P. punctulatum*, Kohl, but is less coarsely punctured and differs in venuration. It is also near *P. nitidum*, Sm., from Aru, of which I have not seen the type, and is probably identical with *P. morosum*, Sm., 1854, from New Guinea, which is not identical with *P. morosum*, Sm., 1856, which is from New Zealand. *P. pallidipalpe*, Sm., differs in the position of the first recurrent nervure, in the deeper sulcus with a carina on the median segment, and in the longer and slenderer tarsi.

## 20. *Trypoxylon gracillimum*, Sm.

*Trypoxylon gracillimum*, Sm. Journ. Proc. Linn. Soc., Zool. vii. p. 35 (1863). ♂.

*Hab.* Mimika River; 1 ♀, August 1910.

## XVIII.—*New Species of Heterocera from Costa Rica.*—XIII. By W. SCHAUS, F.Z.S.

### Noctuidæ.

#### *Rhyncholita ? viridicosta*, sp. n.

♂. Palpi, head, and collar pale green. Thorax whitish buff. Abdomen brown-buff with some dark brown irrorations. Fore wings whitish; costa broadly tinged with pale green and crossed by oblique olive-green shades; cell irrorated with pale reddish brown; the spots round, black, the orbicular small, the reniform large; a basal and a sub-basal black point; some scattered pale reddish-brown irrorations below cell, partly forming an indistinct line from reniform to middle of inner margin; postmedial black points from well beyond cell to near middle of inner margin, followed by a clear white line, expanding at apex, and outwardly edged by an olive-green line; a subterminal small black and brown spot above tornus; terminal black points. Hind wings white; a black discal spot; a fuscous spot at middle of inner margin; terminal black points. Fore wings below with costal margin and part of cell fuscous olive; an



oblique fuscous subterminal line. Hind wings below with black discal spots and a fine postmedial line.

Expanse 26 mm.

*Hab.* Turrialba.

*Chlorhoda metaleuca*, sp. n.

♂. Palpi reddish brown fringed with whitish and shaded with black behind. Head creamy buff, shaded with brown. Collar creamy buff, shaded posteriorly with black-brown, and crossed by a fine blackish line. Thorax silvery grey, darker shaded behind. Abdomen fuscous grey above, creamy buff below. Fore wings silvery grey, faintly shaded with fuscous on basal half, except on costa; some fine brown streaks on extreme costa, and a heavier brown and black medial streak to subcostal; an angled reddish-brown streak with its apex between orbicular and reniform, which are large, close together, and barely defined, the inner portion of streak irregularly indented to submedian fold, the outer portion edging reniform posteriorly; postmedial geminate black points on veins, the inner series connected by a faint fuscous-grey lunular line; subterminal black streaks on veins and a faint brownish shade; an indented brown-black streak from costa near apex to vein 7, followed by a whitish-grey shade, and preceded by a brown shade on costa; faint terminal dark points between the veins. Hind wings white; the apex and veins on outer half streaked with fuscous brown.

Expanse 34 mm.

*Hab.* Juan Vinas, Cachi.

*Phobolusia aurilinea*, sp. n.

Palpi buff, irrorated with metallic scales. Head and thorax whitish with minute brown irrorations. Abdomen above whitish, thickly irrorated with brown and yellow scales, dark brown segmental lines and a white dorsal tuft at base. Fore wings whitish, irrorated with minute brown points and some wavy lines; a broad antemedial golden line, widest on costa; a black point at end of cell; a subterminal yellowish-buff shade preceded by heavier irrorations, and followed at apex by black streaks, some lilacine-silver scales, and then terminal black points; the termen below vein 5 lilacine silver, with two black spots between veins 2 and 4. Hind wings whitish with fuscous irrorations; a spot in cell, a postmedial dark line towards inner margin, and a broad dark terminal shade widest at apex. Under-

neath whitish, with darker irrorations and rather large terminal black spots, the fore wings shaded with brown below cell and before apex.

Expanse 15 mm.

*Hab.* Peralta.

*Steniscadia polyodonta*, sp. n.

♀. Palpi, head, and thorax fuscous grey, the collar shaded with black. Abdomen fuscous. Fore wings grey-brown; a fine, interrupted, subbasal, geminate darker line, marked by black points in cell and some black scaling below cell; an antemedial, fine, lunular, dentate, geminate line, shaded with white on inner margin; two black points on discocellular; the postmedial fine, dark, forming deep projections between the veins, with paler shadings between them; a subterminal fine whitish shade, preceded and followed by brownish spots between the veins; a terminal black line; cilia broad, dark brown, tipped with greyish. Hind wings fuscous, darkest on costa and on outer margin.

Expanse 21 mm.

*Hab.* Sixola.

*Azeta rufescens*, sp. n.

♂. Palpi reddish brown, irrorated above and inwardly with lilacine white. Head, collar, and thorax dark reddish brown; some whitish irrorations on frons. Abdomen lilacine brown above, the lilacine tinge due to the whitish irrorations; underneath light reddish brown. Fore wings: the anterior half dark reddish brown, extending on basal half to near inner margin, otherwise greyish brown irrorated with lilacine white; the costa irrorated with white, especially medially, to postmedial line, and with four small white spots beyond it; antemedial dark reddish brown, angled on subcostal, outset on median, and straight to submedian, then outcurved; orbicular round, white; a dark reddish-brown medial shade angled at reniform, toothed on submedian; reniform large, oval, buff, shaded with brown in front and behind, and with a greyish line on discocellular; postmedial fine, outcurved beyond cell, fuscous brown outwardly edged with lilacine white, and a fine reddish-brown shade; subterminal whitish spots; a lunular fuscous-brown line followed by a reddish-brown sinuous shade. Hind wings greyish brown; a dark brown medial line; the postmedial fine, distinctly geminate, followed by a broad brown shade terminating at the subterminal spots, which are remote from

termen. Fore wings below brown, the costal half tinged with roseate; a black orbicular point; a dark medial line, angled at reniform, which is narrow and indistinct; the postmedial and subterminal spots pale. Hind wings below light reddish brown, the inner margin broadly roseate grey; a yellowish-white discal spot; a dark medial line; the postmedial line, fuscous brown outwardly edged with lilacine; a fuscous shade before subterminal spots.

Expanse 54 mm.

*Hab.* Juan Vinas.

Allied to *A. leucoma*, Feld., but has antennæ ciliate and with fascicles, whereas *leucoma* has the antennæ with shorter cilia and no fascicles; the colour is also quite different.

*Chamyna modesta*, sp. n.

♂. Palpi dull brown. Body brownish buff, the abdomen above tinged with fuscous; underneath whitish. Legs outwardly brown, inwardly whitish; pale rings on tarsi. Wings above brownish buff thinly irrorated with black. Fore wings: costa finely roseate; cilia roseate brown; a faint darker antemedial line; orbicular a minute black point; a darker medial shade terminating in a black spot on inner margin; reniform large, indistinct, slightly paler with a vague fuscous line on discocellular; postmedial slightly darker, indistinct, sinuous with white points on veins; subterminal black points between the veins; terminal black points at veins connected by a fine lunular line. Hind wings: a medial fuscous line ending in a small black spot on inner margin; postmedial, subterminal, and terminal spots as on fore wings. Fore wings below pale fuscous, with faint traces of a fine postmedial line and subterminal spots; a terminal black line. Hind wings below buff-white irrorated with fuscous; a dark discal spot, a postmedial line, and subterminal fuscous shade.

Expanse 45 mm.

*Hab.* Juan Vinas, Tuis.

*Isogona fulgens*, sp. n.

♀. Palpi reddish brown, ringed with buff terminally. Head dark reddish brown; a large buff spot on frons, and a white spot at base of antennæ. Collar light reddish brown in front; behind and also thorax dull greyish brown. Abdomen light reddish brown with segmental buff lines. Fore wings silky reddish brown tinged with lilacine; a silvery

white line on base of costal margin; lines buff finely edged with dark red-brown; subbasal line geminate, expanding in cell, marked by a small black spot above submedian; antemedial slightly indented, and somewhat offset on median; orbicular round, extending across cell; reniform very large, extending above and below cell, its corners angled, not rounded; from angle of reniform below vein 3 a line continues to inner margin, and another to outer line just above 3; the outer line oblique from costa postmedially to vein 3 at termen; a marginal line from a white apical spot, straight to vein 3, twice inset below it; small subterminal black and white spots near apex; three large and one small black spot from vein 3 to inner margin subterminally, the small spot inset. Hind wings silky reddish brown; the costa whitish to near apex; cilia tipped with white. Fore wings below silky reddish brown, the costa broadly whitish; traces of antemedial, medial, and postmedial lines. Hind wings below white: costa irrorated with reddish brown; a medial line from costa through cell; a postmedial line angled towards inner margin; subterminal shadings widest on costa; an interrupted terminal line.

Expanse 30 mm.

*Hab.* La Florida.

*Sasserna ? irrorata*, sp. n.

♂. Palpi brown irrorated with white. Head and collar brown. Thorax and abdomen buff-grey, with a few black irrorations. Thorax below grey; the legs brown; a white spot at end of hind femora. Fore wings brown, irrorated with black and somewhat shaded with grey; a buff shade from within postmedial to apex; an antemedial indistinct line, fuscous brown on costa, irregularly incurved from subcostal to submedian; an oblique fuscous medial line on costa to reniform, which is large, whitish, with fuscous lines, and sometimes completely velvety black; the postmedial line, black, outcurved beyond cell, dentate lunular: subterminal white spots partly shaded with black; some dark striae on termen. Hind wings fuscous, shaded with grey or brown about anal angle, irrorated with black; an indistinct black medial line, and subterminal spots near anal angle. Underneath fuscous grey; black discal spots preceded and followed by white spots; a black postmedial dentate lunular line; subterminal white points. Fore wings: the costal margin whitish grey irrorated with black; terminal black striae. Hind wings thickly irrorated with black.



Expanse, ♂ 33 mm., ♀ 40 mm.

*Hab.* Juan Vinas, Avangarez, Tuis.

In the 'Biologia' this species was mixed with *S. lyde*, Druce, the female being figured under that name.

*ARSACIODES*, gen. nov.

Proboscis minute; palpi with the second joint porrect, extending about the length of head, thickened and fringed with hair above and below at extremity, the third rather long, thick, bent downwards; frons smooth; eyes large; antennæ of male ciliated; head and thorax smoothly clothed with scales and without crests; tibiæ with the spurs long; abdomen with dorsal crest at base only. Fore wing with the inner margin strongly lobed at middle and with slight scale-teeth at middle and tornus; vein 3 from well before angle of cell; 5 from just above angle; 6, 7 from upper angle; 8, 9, 10 stalked; 11 from cell. Hind wing with veins 3 and 5 from near angle of cell; 6, 7 from upper angle; 8 anastomosing with cell near base only.

*Arsaciodes rufa*, sp. n.

♀. Head and thorax bright rufous; pectus whitish; legs pale brown, the tarsi with slight white rings; abdomen fuscous, the ventral surface whitish. Fore wing rufous with a purplish gloss; a wavy white antemedial line defined by a few black scales on outer side; a black point in end of cell; a fine white postmedial line defined by black on outer side towards costa and inner margin, oblique from costa to vein 7, then inwardly oblique and sinuous; a curved subterminal series of black points; a terminal series of black striæ. Hind wing fuscous brown; cilia red-brown, whitish at tips.

Expanse 20 mm.

*Hab.* Banana River, Sixola.

*Renia turpis*, sp. n.

♂. Palpi dark brown, fringed with buff-brown; the last joint buff-brown. Head, collar, and thorax fuscous brown; the patagia shaded with violaceous black. Fore wings violaceous black tinged with brown, crossed by darker striæ; an indistinct antemedial shade outwardly oblique; a similar medial shade inwardly oblique; orbicular minute; reniform almost semilunar, buff-brown, crossed by a velvety black line, reduced to a spot behind in type; a broad postmedial

wavy buff-brown shade; similar subterminal spots on veins in a sinuous row, and shaded with dark brown; small marginal dark spots connected by a vague wavy line. Hind wings dark brown, shaded with violaceous black on outer margin, medially above vein 2, and on inner margin; a dark, dentate, lunular, postmedial line, partly shaded outwardly with buff-brown; subterminal whitish spots on veins 2, 3, and 4.

Expanse 53 mm.

*Hab.* Sixola, Guapiles, Tuis, Bugaba.

*Scopifera repanda*, sp. n.

♂. Palpi brown, darkest at base, fringed in front with buff. Head, collar, thorax, and fore wings fuscous brown, tinged with lilacine. Abdomen and hind wings fuscous. Fore wings: antemedial and postmedial lines fine, black, lunular, the latter outcurved; a faint darker medial shade angled at reniform; orbicular a small whitish-yellow spot; reniform dark velvety brown, divided by a light reddish-brown shade and with a yellowish point on basal side; a subterminal light brown sinuous line, darkly edged and followed by a cluster of white scales above vein 5; a few white scales scattered over the wing.

Expanse 42 mm.

*Hab.* San José, Juan Vinas.

*Regectaria marginalis*, sp. n.

♂. Palpi, head, collar, and thorax dark reddish brown. Abdomen fuscous brown, irrorated with white below. Fore wings dull brown to outer line; a greyish shade at base below cell; antemedial and medial perpendicular, wavy, darker brown, the antemedial shaded rather broadly with reddish brown; reniform very indistinct, faintly tinged with grey; a very faint wavy postmedial line, followed by the fine brown outer line, straight and perpendicular from inner margin to vein 7, where it is outcurved and lost in an apical brown shade; inwardly it is finely edged with lilacine and outwardly followed by a broad lilacine shade which reaches costa and has its outer edge forming three curves; termen broadly fuscous grey. Hind wings dull fuscous brown; an outer line and greyish shade from vein 5-2. Hind wings below with an outer lilacine line.

Expanse 45 mm.

*Hab.* Juan Vinas, Sitio.

*Regectaria splendida*, sp. n.

♂. Palpi, head, collar, and thorax very dark brown, with some lilacine irrorations; abdomen lighter brown, with a few white scales; legs and tarsi spotted with white; fore coxæ irrorated with white. Fore wings dark brown, especially the medial space, which has only a few lilacine irrorations; base heavily irrorated with lilacine, limited by the white antemedial line, slightly oblique inwardly from costa; a fine white postmedial line, straight and slightly oblique inwardly, followed on inner margin by a large cluster of lilacine scales; subterminal short white streaks on veins and a small cluster of lilacine scales above vein 5; terminal white spots; cilia irrorated with white. Hind wings paler; the outer line and lilacine irrorations only between veins 2 and 5, and some irrorations near inner margin; the termen with the lilacine irrorations diminishing towards apex.

Expanse 45 mm.

*Hab.* Juan Vinas.

*Strathocles funebris*, sp. n.

♂. Body very dark brown; the tarsi with whitish rings. Wings dull dark brown, the lines of a still darker shade. Fore wings: the antemedial perpendicular, outcurved between the veins; a median shade from reniform, sinuous to inner margin; reniform buff-brown, crossed by a dark line; postmedial line, wavily dentate, perpendicular; subterminal fine, somewhat heavier on inner margin, outcurved between veins 3 and 4 and 6 and 7, the curves filled in with velvety black-brown patches, very conspicuous. Hind wings: faint traces of a darker postmedial shade; a subterminal darker spot near anal angle. Wings below fuscous brown, with indistinct postmedial and subterminal lines. Fore wings: the costal margin from base to beyond middle with thick downturned hairs; a streak of long dull brown hairs in cell.

Expanse 36 mm.

*Hab.* Juan Vinas, Tuis; also from French Guiana.

The female of this species is the female *S. ribbei*, Dr., of the 'Biologia.'

*Aristaria vinasalis*, sp. n.

♂. Palpi dark brown, tipped with whitish buff. Frons dark brown; vertex, collar, and thorax buff. Abdomen fuscous. Femora brown, tibiæ and tarsi whitish buff; fore coxæ with tufts of roseate hairs. Fore wings greyish buff;

costa narrowly ochreous, edged with black in front; a fine dark basal line; antemedial line, black, dentate, outwardly oblique from costa; orbicular round, whitish buff, partly edged with black scales; a black-brown median line inwardly oblique from subcostal, widest and more heavily marked on inner margin, partly followed by a brownish shade; reniform large, whitish buff, containing two black spots; postmedial line fuscous brown, fine, deeply lunular, with black points at angles, followed by a heavy fuscous-brown shade, outwardly dentate, especially at vein 4; marginal black points between the veins; terminal black points at veins, the two rows connected by an indistinct angled line. Hind wings fuscous, shaded with dull brown in and below cell; traces of a darker subterminal line, geminate near anal angle and surmounted by some buff mottling; some terminal buff shadings about veins 2 and 3; cilia buff.

Expanse 48 mm.

*Hab.* Juan Vinas, Sitio.

This species varies considerably in colour, some specimens being reddish brown.

*Neoherminia modestalis*, sp. n.

♂. Palpi, head, collar, and thorax brown. Abdomen and hind wings fuscous. Fore wings dull brown; antemedial and postmedial lines very faint, darker brown, the latter wavy, inbent towards reniform, dentate lunular below vein 3; spots grey, edged with black-brown, the orbicular very small, the reniform moderate; a vague subterminal shade twice outcurved, defined by lilacine scales, which extend over the outer margin.

Expanse 33 mm.

Female: The lines more clearly defined; the spots buff, the reniform larger and crossed by a dark brown line; the subterminal dark, outwardly shaded with buff-brown, the lilacine scaling absent.

*Hab.* Poas, Turrialba.

*Tortricodes barbaralis*, sp. n.

♂. Body violaceous black, the palpi fringed with ochreous brown; abdomen below mottled with white. Fore wings dark lilacine grey, the lines whitish buff; the antemedial outcurved through cell, incurved below median, the postmedial incurved below vein 2, both broadly shaded on medial side with black-brown; an oblique velvety-black streak as orbicular; reniform small, ochreous brown, inwardly edged



by a fine black line; the subterminal outcurved on vein 7, indented just below 7 towards postmedial, enclosing a black-brown space, then incurved around cleft, followed by an ochreous shade, and perpendicular from vein 2 to inner margin, preceded by a black-brown shade; a dark terminal line. Hind wings black, a large white space from base in, beyond, and below cell, on which the median and veins 2-4 are black.

Expanse 30 mm.

*Hab.* Juan Vinas, Tuis, Sitio.

Allied to *T. dulcina*, Schs., which has the apex white.

*Megachyta rona*, sp. n.

♂. Body brownish grey, the abdomen terminally darker; body below whitish buff. Fore wings brownish grey, the lines black, fine, the antemedial slightly oblique from costa, perpendicular below median; a dark streak on discocellular; the postmedial very slightly outcurved beyond cell; a faint subterminal fuscous shade, faintly edged outwardly with white, which becomes a distinct white spot on costa; the outer margin darker grey; a terminal black line; cilia darker grey, with a pale line at base. Hind wings similar; a black discal spot; the postmedial line angled at vein 2. Fore wings below greyish; a black discal point; a white costal spot before apex; postmedial line and subterminal shade very faint. Hind wings below whitish; a discocellular streak; a fine outer line; a subterminal fuscous shade.

Expanse 18 mm.

Female similar, but darker and browner.

*Hab.* Carillo, Laguna, Tuis.

*Megachyta acutipennis*, sp. n.

♂. Body above dark greyish, with pale transverse striae on thorax and pale segmental lines on abdomen. Underneath whitish, irrorated with dark grey, the legs buff-white. Wings lilacine grey, with darker irrorations; an antemedial and a postmedial fine wavy dark line; a sinuous subterminal dark shade; a terminal dark line, pale edged and interrupted by veins. Fore wings: a fine medial line; two white spots on discocellular; a small black apical spot. Fore wings below fuscous grey, a fuscous discal spot; a fuscous subterminal shade, broad and black from vein 6 to costa; terminal black points between veins. Hind wings below whiter, irrorated with dark grey; a discal point and traces of a subterminal fuscous shade. Fore wings acute.

Expanse 20 mm.

Female: Wings light brown and very similar to that sex of *M. anser*, Dr., but the two species can be readily separated by the markings underneath.

*Hab.* Carillo, Laguna.

*Hypena cachialis*, sp. n.

♂. Body fuscous; some greyish irrorations on palpi. Fore wings black-brown; a subbasal line, sinuous and slightly oblique outwardly, velvety brown inwardly edged with grey; orbicular and reniform as small black points; postmedial undefined black, very slightly incurved, defined by the broad whitish-grey shade which follows it, this shade becoming darker outwardly and crossed by a wavy and a lunular fuscous-brown line; a greyish shade from vein 6 to apex. Hind wings fuscous brown; cilia black. Underneath dull brownish; black discal points; an indistinct outer fuscous line; a subterminal black point below costa on fore wings; a vague subterminal fuscous shade on hind wings.

Expanse 32 mm.

*Hab.* Cachi.

*Hypena devexalis*, sp. n.

♂. Head, collar, and thorax lilacine brown, irrorated with whitish grey. Abdomen fuscous. Fore wings dull brown, shaded with buff-grey on postmedial space; lines greyish buff; antemedial oblique from costa, inset below submedian; postmedial oblique from costa, outcurved beyond cell and less so between 3 and 2; an outer vague fuscous shade, somewhat outcurved, followed by a dark space on costa; subterminal curved around costal space, outcurved below 6, and outbent below 2 to tornus; a terminal dark brown line interrupted by veins. Hind wings fuscous; a terminal black line. Fore wings below fuscous grey, irrorated with greyish; a subterminal black and white spot below costa. Hind wings below whitish grey, thickly irrorated with dull brown; a black discal point; a postmedial brownish line; both wings with a terminal black line, interrupted by pale points on veins.

Expanse 31 mm.

*Hab.* Juan Vinas, Cartago.

*Hypena ducalis*, sp. n.

♂. Palpi, head, and thorax brown, thickly irrorated with

whitish grey. Abdomen greyish brown. Fore wings pale lilacine brown; an oblique whitish-grey line from costa subbasally, inbent from just above submedian and straight on inner margin, then shaded outwardly by a fine dark brown line; a large medial chocolate-brown space to beyond cell, its outer edge slightly oblique on costa, incurved from vein 5, and not touching submedian; a fine line from its lower edge reaches middle of inner margin; a fine brownish postmedial line outcurved and slightly wavy; subterminal fuscous spots, edged with white outwardly, chiefly near costa; veins terminally with dark streaks; a terminal narrow dark brown shade; the costa medially rather lighter than dark medial space. Hind wings white; the margins broadly fuscous brown; a terminal dark brown shade near anal angle. Fore wings below fuscous; a subterminal white point below costa. Hind wings below white, the outer margin broadly fuscous.

Expanse 39 mm.

*Hab.* Cartago.

*Hypena frigida*, sp. n.

♂. Palpi, head, collar, thorax, and fore wing dark violaceous brown, finely irrorated with lilacine grey, less so on basal half of wing from below subcostal; an indistinct dark antemedial line, partly shaded with brownish scales; a similar sinuous medial line; an indistinct darker postmedial curved shade; subterminal dark spots, shaded with faint lilacine grey and marked by a distinct white point below costa. Hind wings white at base, the margins broadly black, gradually suffusing with the white; a black streak on discocellular. Fore wings below black; a subterminal white spot above vein 7. Hind wings below with the white extending to inner margin and nearer outer margin; a black discal point; a black postmedial line, most distinct near costa.

Expanse 37 mm.

*Hab.* Volcano Poas and Turrialba.

*Hypena gaudialis*, sp. n.

♀. Palpi, head, collar, and thorax lilacine brown, with whitish-grey irrorations and transverse striæ. Abdomen grey-brown, thickly mottled with fine white irrorations. Fore wings lilacine brown, fuscous brown on apical area; a large oblique medial space, chocolate-brown, its inner edge oblique to submedian and finely edged with lilacine white, then outbent to below submedian, its outer edge outcurved to vein 4 at cell, then faintly incurved to costa, followed by a

white line and broad whitish space beyond cell, crossed by a brownish postmedial line, following contour of dark patch to inner margin; traces of subterminal spots and greyish irrorations from vein 4 to inner margin. Hind wings white, the margins broadly black. Fore wings below grey-black; a broad white patch beyond cell from vein 8 to vein 2. Hind wings below white, the margin broadly grey-black, irrorated with white, except basal half of costa, which is narrowly dark.

Expanse 30 mm.

*Hab.* Juan Vinas.

The sexes are similar.

*Hyppena thontes*, sp. n.

♀. Palpi brown, thickly irrorated with grey. Head dull brown; collar and thorax reddish brown; abdomen fuscous brown; legs buff, irrorated with brown. Fore wings to beyond middle reddish brown, limited by a straight roseate white line, outwardly shaded with roseate grey; the outer margin broadly fuscous brown, crossed by a sinuous row of lunular black spots rather remote from margin; a black point at base of cell; a fine darker reddish-brown antemedial line, outwardly oblique from costa; a black point in middle of cell; a dark terminal line. Hind wings fuscous brown; a terminal darker line; some pale shadings on base of cilia.

Expanse 35 mm.

*Hab.* Juan Vinas, Sixola, La Florida.

Some specimens have a greyish shade at apex.

XIX.—*Preliminary Descriptions of Three new Species of Thysanoptera.* By RICHARD S. BAGNALL, F.L.S., F.E.S.

I WAS recently able to spend a couple of hours in the British Museum, and take the opportunity of describing briefly two new and interesting thrips—*Docessissophothrips major*, sp. n., and *Mecynothrips simplex*, sp. n. I also add a short description of a new *Pamurothrips* from a small collection submitted to me by Mr. V. Subramania Iyer, M.A., F.L.S., of the Indian Forestry Research Institute, Dehra Dun.



## Phlæothripidæ.

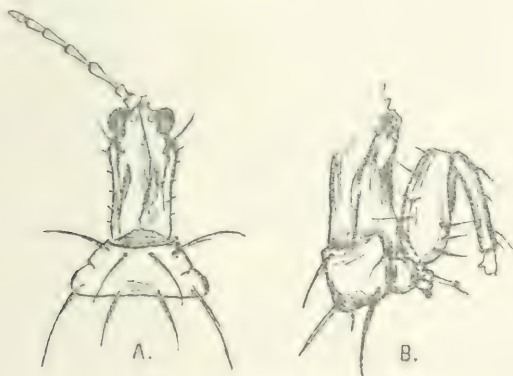
## Genus DOCESSISSOPHIOTHRIPS, Bagnall.

*Docessissophothrips major*, sp. n.

Length about 6·5 mm.

Colour reddish brown; third antennal joint yellowish white, shaded with brown at tip.

Head more strongly flattened laterally than in *ampliceps*, Bagn., but not so flattened as in *monstrosus*, Bagn.; constricted behind eyes and widest just before the constriction; eyes small but prominent. Maxillary palpi with second joint very long, about four times as long as the first. Third joint of antenna longest, seventh and eighth joints apparently connate.



*Docessissophothrips major*, sp. n.

A. Head and prothorax, viewed dorsally.

B. The same, viewed laterally, with right front leg.

All prothoracic bristles exceptionally long. Wings reaching to tube. Hind and intermediate legs long and somewhat stout, each tibia with two exceptionally long setæ on outer margin.

Tube stout, not quite as long as the head; bristles of the ninth abdominal segment about seven-eighths the length of the tube.

*Type.* British Museum. One carded specimen, without data. Coll. Fry.

## Idolothripidæ.

## Genus MECYNOTHRIPS, Bagnall.

*Mecynothrips simplex*, sp. n.

Length about 9.0 mm.

Superficially this form closely resembles *M. wallacei*, Bagn., and is similar in its type of coloration. The antennæ are slightly stronger and have not the prominent long hair at the outer apical margin of each of the intermediate segments. The lateral cephalic setæ spring from very minute warts and are not conspicuous.

The prothorax is simple, with a moderately long forwardly directed seta set on a slight protuberance at each anterior angle. The fore femur is more strongly crassate and apparently has not the strong tooth near the apical third within seen in *M. wallacei*, but it appears to have a minute tooth at the apex within. The hind and intermediate legs are relatively shorter and stouter. The wings reach to the fifth abdominal segment.

The tube is longer than in *wallacei*, not quite three times as long as the penultimate segment and nearly as long as the eighth and ninth segments together.

*Type.* In the British Museum.

*Hab.* One ♂ (carded specimen). Collected by E. Simon, Philippines, 1903.

## Genus PANUROTTHRIPS, Bagnall.

*Panurothrips coriaceus*, sp. n.

Length, including tube (which is about one-third the length of the total), 3.65 mm.

Colour dark chestnut-brown; fore tibiæ shading to yellow distally and all tarsi yellow. Antenna, excepting the two basal joints, clear yellow.

Head about once and a quarter as long as broad; cheeks broader than the breadth across eyes, parallel, and furnished with minute spine-set warts. Antennæ about one and three-quarters as long as the head, rather stout. Prothorax transverse, about three-fifths the length of the head, disc depressed; a short and somewhat stout spine at each posterior angle. Surface of head, thorax, and femora roughly reticulated. Wings reaching to the sixth abdominal segment. Abdomen gradually narrowing to the tube; segments 1 to 7 strongly transverse, lateral setæ very short and stiff. Tube narrow,

slightly curved upwards, about three and one-half times as long as the head; closely set with moderately long setæ to the distal fifth. Terminal hairs very short.

*Hab.* India; four specimens, together with several nymphs and pupa, taken by Mr. Iyer on "Piaman" leaves at Karwappany, West Dehra Dun, base of the West Himalayas.

*P. coriaceus* much more nearly approaches the South African species *caudatus*, Bagn., than the Malayan *gracilis*, Bagn. It is a smaller species, the head is much shorter and broader, and the surface is roughly sculptured, either reticulate or finely scabrous; the abdominal segments are strongly transverse, whilst the tube is, compared with the length of head, even longer than in *caudatus*.

The discovery of *caudatus* and this species, which in the form of the abdomen differ strongly from the type *gracilis*, would seem to show that the genus *Panurothrips* has stronger affinities with the Phleothripidae than with the Idolothripidae.

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## XX.—The Osteology of the Teleostean Fishes of the Order Opisthomi. By C. TATE REGAN, M.A.

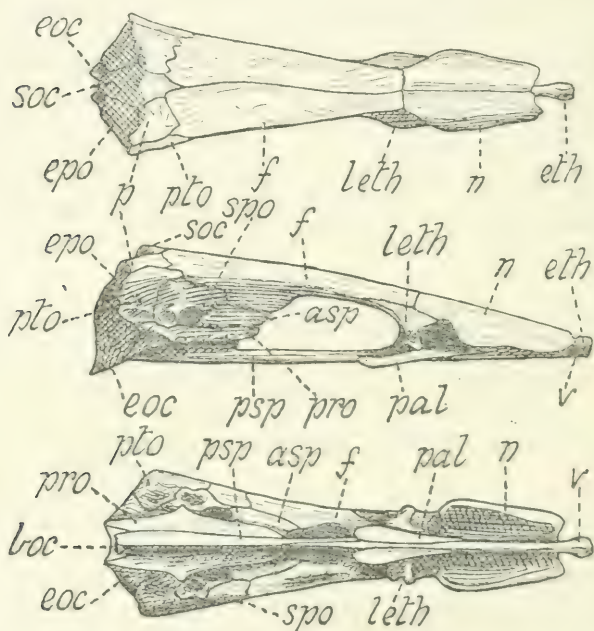
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THE order Opisthomi comprises the single family Mastacembelidae, with two genera, *Mastacembelus* and *Rhynchobdella*, from the fresh waters of Africa and Southern Asia. These fishes have the body elongate and compressed, covered with small scales; the many-rayed dorsal and anal fins are contiguous to or confluent with the small caudal; the dorsal is preceded by a series of isolated spines and the anal has three spines, the second strong and depressible in a groove; the pectorals are well developed, but the pelvic fins are absent. The mouth is small or of moderate size, terminal or subterminal, with villiform teeth in the jaws and sometimes on the vomer; the maxillaries are firmly attached to the non-protractile premaxillaries. There are two nostrils on each side, the posterior in front of the eye, the anterior tubular, at the side of a fleshy tentacle at the end of the snout. The gill-membranes are separate or narrowly united, and free from the isthmus, but the gill-openings are restricted from above, the operculum having no free edge.

Such are the principal external characters of this group of apodal acanthopterous physoclists; the skeleton indicates

that these fishes are related to, but more specialized than, the Percomorphi, but they show no particular affinity to any group of Percomorphous fishes.

The skull is elongate, narrowed forwards, without crests or ridges on the upper surface; the parietals are separated by the supraoccipital; there is no opisthotic, but the other otic bones are normally developed; alisphenoids are present, but



*Mastacembelus armatus*. Skull from above, from the side, and from below.

p, parietal; f, frontal; n, nasal; eth, mesethmoid; leth, lateral ethmoid; v, vomer; pal, palatine; soc, supraoccipital; eoc, exoccipital; boc, basioccipital; epo, epiotic; pto, pterotic; spo, sphenotic; pro, proctic; asp, alisphenoid; psp, parasphenoid.

there is no basisphenoid nor orbitesphenoid. The nasals are very large, meet in the middle line, and are firmly united to the upper edge of the mesethmoid, which forms a vertical septum between the nasal cavities; the præorbital is rather large, articulates with the lateral ethmoid, and is attached to the lower edge of the nasal; the suborbitals are unossified. The hyo-palatine and opercular bones are all present, but



the palatine and pterygoid are very peculiar; the former is an elongate narrow lamina which is firmly united to the lower surface of the vomer and also to the mesethmoid, lateral ethmoid, and parasphenoid; the pterygoid is movably articulated with the lateral ethmoid external to the palatine. The branchial skeleton is percooid.

There is no post-temporal, and the supra-cleithrum is attached by ligament to the third or fourth vertebra; the hypercoracoid is perforate, the hypocoracoid has a strong post-coracoid process, and there is no mesocoracoid; there are 1 radials, 2 on the hypercoracoid and 2 on the hypocoracoid.

The vertebræ are numerous, 77 to 95 (34-44 + 43-51); the first centrum is convex, fitting into the concavity formed by the basi- and occipitals; the ribs are inserted on strong parapophyses.

# XXI.—A new Gerbil from British East Africa.

By GUY DOLLMAN.

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## *Tatera phillipsi umbrosa*, subsp. n.

♂. 497. Hot Springs, near Baringo.

♂. 1372, 1384, 1395; ♀. 1318, 1335, 1383, 1389, 1400. Baringo (R. Kemp).

A dark-coloured race of *Tatera phillipsi*.

Size and proportions much as in *phillipsi*, head and body dimensions rather greater. General colour of dorsal surface very much darker than in the Somali form, the sandy colour of that species is here hidden by a dark brownish wash. Flanks rather lighter in colour, the buff tint more evident than on the shoulders or back. Head and face very much darker. Ears clothed with short dark hairs, the general effect conspicuously different from the yellowish-buff ears of *phillipsi*. Backs of hands and feet rather thinly clad with white hairs; in the Somali form the feet are thickly covered with snow-white hairs. Ventral surface of body white. Tail dark brownish black above, paler in the basal portion; apical region dark brown. Under surface of tail dirty white, tinted with buff.

Skull about equal in size to that of *phillipsi*; teeth a trifle smaller.

Dimensions of the type (measured in the flesh):—

Head and body 135 mm.; tail 170; hind foot 32; ear 18.5.

Skull: greatest length 38.6; basilar length 29.5; condylo-incisive length 33.5; zygomatic breadth 19.6; interorbital constriction 6.8; squamosal breadth of brain-case 16.4; palatilar length 17.5; length of palatal foramina 6.5; alveolar length of upper molar series 6; length of upper molar series 5.5.

*Hab.* Baringo, British East Africa. Altitude 4000 feet.

*Type.* Old female. B.M. no. 10.12.19.15. Original number 1383. Collected by Mr. Robin Kemp on October 13th, 1910. Presented to the British Museum by Mr. C. D. Rudd.

This Baringo gerbil appears most nearly related to the Somali species, *T. philippsi*, as is clearly shown by the similarity between the skulls of the two forms. The external colour-difference is however so marked that it is necessary to consider the Baringo specimen as representing a distinct dark-coloured race of *philippsi*. In general colour this new form most nearly approaches *T. dundasi*, a species described by Wroughton from Mt. Elgon; but *umbrosa* does not appear to be in any way closely allied to the Elgon gerbil, which is a very much larger animal, with a skull 45 mm. in length.

## XXII.—*Descriptions and Records of Bees.*—XLII.

By T. D. A. COCKERELL, University of Colorado.

### *Megachile cetera*, sp. n.

♀.—Length about  $10\frac{1}{2}$  mm.

Black, with white and black hair, the broad abdomen with distinct white hair-bands. In nearly all respects like *M. quinquelineata*, Ckll., but the mesothorax and scutellum are minutely and densely rugoso-punctate, the tegulae are rufo-fuscous, and the hair on the inner side of the tarsi is clear ferruginous.

*Hab.* Nagambie, Victoria, 1910 (*French*) = type; Gippsland, Victoria (*Froggatt*); Sydney, N.S.W., one from F. Smith's collection, erroneously labelled *M. maculata*, Smith; near Cooma, N.S.W., Jan. 10, 1903 (*Sellar*).

The specimen from near Cooma has no black hair on

head and thorax above, but the pubescence is stained with brown. It possibly represents a distinct race. All the specimens, except that from Sydney, are from the Froggatt collection.

*Megachile glaberrima*, Friese, appears to be very close to *M. quinquelineata*, Ckll.; both were taken by Turner at flowers of heliotrope at Mackay. *M. glaberrima* differs from *quinquelineata* in having the hair of head and thorax all white, according to Friese's account.

*Megachile trichognatha tosticauda*, subsp. n.

♀.—Length about 8 mm.

Agrees with *M. trichognatha*, except that it is smaller, with the apical median clypeal elevation very small or absent; the lower margin of the clypeus rather obscurely crenulate; the flagellum bright ferruginous beneath; and the punctures of upper part of head and thorax conspicuously larger. The ventral scopa is entirely white; the fifth and sixth abdominal segments above, and the hind margin of the fourth, are almost entirely covered with fulvous hair; the tegument of the apical part of the abdomen is black, except the hind margin of the fifth segment, which is narrowly red. Also close to *M. eucalypti*, Ckll., but smaller, with the antennæ differently coloured, and not so much of the abdomen fulvous-haired.

*Hab.* Mackay, Queensland, December 1910 (Turner). British Museum.

Probably a distinct species, but so close to *M. trichognatha* that, with only two specimens, and no male, I treat it as a subspecies. Superficially, the insect looks like an unusually slender *M. gilbertiella*, Ckll.

*Megachile holura*, sp. n.

♂.—Length about  $9\frac{1}{2}$  mm.

Parallel-sided, black, with black and white hair, and a large red apical hair-patch on abdomen; hair of head and thorax long, white, but black on vertex, mesothorax, and disc of scutellum; head large but normal; clypeus normal, very densely punctured; antennæ long and slender, entirely black; upper part of head dull and extremely densely punctured, but there is a shining area laterad of each posterior ocellus; mesothorax and scutellum densely punctured; tegulæ black. Wings hyaline, with a brownish tint, nervures dark; recurrent nervures joining second s.m. near base and

apex, the distance the same in each case. Legs black, anterior tarsi slender and simple. Abdomen closely punctured, with white hair on first segment and apically at sides of second, beyond which the hair is short and black, except for the large apical orange-red patch, which extends from the apical middle of the fourth segment, covers the fifth except the sides, and thinly clothes the middle of the sixth; tegument under the red patch black; sixth segment very broadly rounded but produced apically, quite entire; venter with white hair.

*Hub.* Rutherglen, Victoria, 1909 (*French*). From the Froggatt collection, number 60. Froggatt's 60 *a*, also collected by French in 1909 at Rutherglen, is a female *M. trichognatha*, Ckll. It happens, however, that the male of *trichognatha* is known, and by the structure of the abdomen, especially, is quite distinct from *M. holura*.

*M. holura* is evidently close to *M. canifrons*, Smith, differing apparently by the black hair on the head and thorax above, and the greater extent of the apical red patch on the abdomen. *M. canifrons* occurs in Western Australia.

*Megachile cincturata*, sp. n.

♀.—Length 13 mm.

Black, with short black hair, some white at sides of metathorax, hair on upper side of first abdominal segment dense and pure white, white also along the extreme base of second, and on its basal two-thirds at sides, abruptly limited apicad; ventral scopa bright coppery red, blackish red on the last segment and apex of penultimate one; mandibles broad, with two strong apical teeth and a long inner cutting-edge; face with short black hair, and some pale to the inner side of bases of antennæ; clypeus short and broad, rough, wholly without keel, but supraclypeal area obtusely keeled; antennæ black; head and thorax above dull and roughened; cheeks much narrower than eyes, sharp-edged posteriorly; pleura strongly punctured; tegulæ black; upper wings and apical part of lower very dark fuliginous, strongly violaceous; legs black, hair on hind tarsi very dark reddish.

♂.—Length about  $9\frac{1}{2}$  mm.

Similar to the female; between the antennæ is a large bunch of white hair, directed upwards; at the sides of the face the hair is white, overlapped in the middle by black; the lower margin of the clypeus carries a long thick fringe of white hair; lower part of cheeks with long white hair; on the abdomen, the first segment is densely white-haired



at sides and above, the second has a dense white lateral apical band, the third has a trace at sides, and there are three ventral white hair-bands; clypeus densely punctured, with a rudimentary keel (smooth line); antennæ long and slender; punctures of disc of mesothorax evidently separated; sixth abdominal segment broadly rounded, slightly emarginate, with a deep median pit; anterior coxæ with small protuberances; anterior tarsi simple; middle tarsi with ochreous hair.

*Hab.* Cape York, Queensland, 1909 (*Froggatt*, 40 and 41). The female is the type.

This species, which is extremely like *Carlorys weinlandi*, Schulz, in appearance (this *Carlorys* further approaches the *Megachile* in having hairless eyes), is evidently related to *M. biroi*, Friese, but *biroi* has the clypeus keeled in the female. It is also near *M. lachesis*, Smith, but smaller, and the abdomen (without a keel on the sixth segment in the male) differs considerably from that of *lachesis*.

*Megachile fuscitarsis*, sp. n.

♂.—Length about 14 mm.

With parallel-sided abdomen; black, including legs and antennæ; hair of face and front light yellow, long and dense; hair otherwise rather dull white, with a good deal of black dorsally, that of vertex black, but of occiput white, of mesothorax mixed with black, of scutellum nearly all black; eyes large, reddish brown; vertex shining, well punctured; mesothorax and scutellum dull, densely punctured; tegulæ piceous. Wings strongly suffused with brown, the anterior wings very dark, especially in the costal and apical regions; b. n. falling far short of t.-m.; first r. n. entering the extreme basal corner of second s.m. Legs with white and black hair, reddish on inner side of hind tarsi; middle tarsi with an extremely long posterior fringe, the upper part of which is nearly all black, the lower (apical) glittering yellowish white; anterior coxæ with very large spines; anterior basitarsi expanded into an enormous flattened structure, which is dark brown or black, with much white hair on the outer side, and has posteriorly a long, thick, black fringe, the base of which has a fringe of short white hair. Abdomen shining, well punctured, with greyish-white hair on first segment and basal part of second, lateral white fringes on the second and third, with a rudiment on the fourth, and greyish-white tomentum (with long black hairs intermixed) about the middle of the fifth and

sixth; discs of third and fourth segments, and sides of fifth, with black hair, the same also on apical part of second and at sides of sixth; sixth segment broadly truncate, with a strong median apical spine; ventral segments with white appressed hair and white fringes.

*Hab.* Queensland, Sept. 1900 (C. F., Turner collection). British Museum. Exact locality unknown.

Related to *M. vestitor* and *M. fabricator*. Known from *M. vestitor*, Ckll., by the much darker wings, the yellow hair of face, black flagellum, &c.; from *M. fabricator*, Sm., by the character of the anterior legs.

*Exoneura angophoræ*, sp. n.

♀.—Length about  $6\frac{1}{4}$  mm.

Black, with deep ferruginous abdomen and legs; clypeus with a longitudinal pale yellowish line or band; a barely visible transverse supra-clypeal line; each side of face with a small pale yellow mark, which may be absent; clypeus with exceedingly fine scattered punctures; labrum very dark reddish, mandibles almost black; scape obscurely dark reddish in front. Legs black basally; outer side of hind tibiae and tarsi with coarse black hair; tegulae very dark rufo-piceous. Wings moderately dusky, much less reddened than in *E. bicolor*. Abdomen without dark spots, but first segment more or less blackish in middle; apical two segments dull, microscopically tessellate, and punctured; tubercles dark, fringed with white hair.

*Hab.* Sydney, New South Wales, at flowers of *Angophora*, Nov. 24, 1910 (*Froggatt*, 109).

Allied to *E. bicolor*, Smith, but separated by the colour of the wings, and especially the abundant black hair on the hind legs.

*Exoneura froggatti*, Friese, was also taken at *Angophora* flowers at Sydney, Dec. 1, 1910 (*Froggatt*, 108).

*Exoneura ploratula*, sp. n.

♀.—Length about  $4\frac{1}{3}$  mm.; anterior wing about  $3\frac{2}{3}$ .

Head, thorax, and abdomen entirely black, the face without light markings; legs chestnut-red, the anterior femora black except at apex, but the others clear red; antennae black, the scape red in front. Wings yellowish hyaline, not dusky, nervures light ferruginous, the large stigma dark red, second s.m. somewhat longer below than high; tibial scopa of hind legs pale yellow; last two abdominal segments dull.

*Hab.* Sydney, New South Wales, at flowers of *Angophora*, Dec. 1, 1910 (*Froggatt*, 116).

Resembles *E. froggatti* in its small size and dark face; *E. botanica*, Ckll., in its small size and black abdomen.

*Trigona angophoræ*, sp. n.

Worker.—Length about  $4\frac{1}{2}$  mm.

Intense black, without light markings; flagellum ferruginous beneath; labrum and mandibles black, the latter reddened at apex, which has a very broad cutting-edge, and mesad of this two small but strong triangular teeth, being thus essentially tridentate; antennal sockets and extreme base of scape testaceous; face with a very fine pale pruinosity due to minute hairs; pleura with greyish-white hair; mesothorax and scutellum shining, with rather coarse erect black hair. Wings blackish translucent, with dark stigma and nervures. Abdomen short and broad, shining. Legs with black hair.

*Hab.* Sydney, New South Wales, at flowers of *Angophora*, Dec. 1, 1910 (*Froggatt*, 118).

Related to *T. biroi*, Friese, but larger. It is distinguished from *T. carbonaria*, Sm., by the blackish wings, the face narrower below, &c. In typical *carbonaria* the scutellum is fringed with pale pubescence, but, unless I have confused two species under this name, this character is not constant.

PARASPHECODES, Smith.

The species now described may be separated as follows:—

- |   |  |
|---|--|
| Thorax above with fulvous moss-like hair.   | <i>bryotrichus</i> , Ckll.                   |
| Thorax above without such hair . . . . .  | 1.   |
| 1. Sides of metathoracic truncation above with a tooth-like projection . . . . .    | <i>microdontus</i> , Ckll.                   |
| Sides of truncation without such a projection . . . . .                             | 2.   |
| 2. Males; abdomen black beyond the third segment . . . . .                          | 3.   |
| Females; abdomen with the apical part red or reddish . . . . .                      | 4.   |
| 3. Larger; mesothorax rather coarsely punctured; area of metathorax plicate . . . . | <i>hybodin</i> us, Ckll.                     |
| Smaller; mesothorax very minutely punctured; area of metathorax reticulate . .      | <i>recantans</i> , Ckll.                     |
| 4. Smaller; tegulæ rufo-fuscous . . . . .   | <i>speculiferus</i> , Ckll.                  |
| Larger; tegulæ piceous . . . . .  | <i>speculiferus</i> , Ckll., var. <i>a</i> . |

*Parasphecodes bryotrichus*, sp. n.

♀.—Length about  $8\frac{1}{2}$  mm.

Head and thorax black; abdomen pale red, the last

segment suffused with blackish; femora at apex, and tibiae except some dark markings, red, tarsi dark reddish; middle of mandibles broadly and lower part of clypeus red. Superficially, this looks exactly like *P. basilautus*, Ckll., except that the hair on scutellum and adjacent parts is not so dense, and therefore does not appear as a light spot or patch. The species is very close to *P. basilautus*, differing by the darker legs, with fuscous hair on the outer side of middle and hind tibiae and tarsi. There is a large tuft of long light hair on the upper part of the metathoracic truncation. Flagellum entirely dark.

*Hub.* Cheltenham, Victoria, 1909 (*French*); from the Froggatt collection, no. 83.

The name of the locality, in this and some other instances, is misspelled on the label; I am able to make the necessary corrections from an accurate list of localities kindly supplied by Professor Froggatt. In my table of Smith's species (*Ann. & Mag. Nat. Hist.*, Sept. 1904) this runs perhaps nearest to *P. taluchis*, but the wings are only slightly yellowish, and the large metathoracic area has only very delicate irregular wrinkles, mainly confined to the base, except a single median one. *P. taluchis* is also smaller and otherwise different.

*Parasphecodes microdantus*, sp. n.

♀.—Length 8 mm. (but abdomen of type much retracted).

Robust; head, thorax, legs, and antennae black; abdomen dark chestnut-red, nearly uniform in colour; head and thorax with hair rather abundant, pale dull greyish, very obscurely brownish-tinted dorsally; mandibles dark; clypeus shining, with large scattered punctures; middle of front dull and granular; mesothorax shining, but finely and quite closely punctured; middle of scutellum shining, with the punctures well separated; area of metathorax not defined, very irregularly roughened and wrinkled, with some oblique more regular striae basally at the sides; posterior truncation sharply defined above and at the sides, and having a tooth-like marginal projection near each upper corner; tegulae very dark reddish. Wings dusky translucent, a little reddish; stigma and nervures ferruginous; first r. n. entering basal corner of third s.m., third t.-c. and second r. n. much weakened. Hair of legs pale yellowish, more or less fuscous on outer side of tibiae, pale orange on inner side of tarsi; hind spur simple. Abdomen very finely punctured, without lateral hair-patches.



*Hab.* Melbourne, Victoria, Aug. 1900 (*C. F.*, Turner collection). British Museum.

In the table in *Trans. Amer. Ent. Soc.* 1910, p. 243, this runs nearest to *P. froggatti*, of which only the male is known. It can hardly be that species, however, on account of the weakened outer nervures. In the table of Smith's species it runs nearest to *P. tilachus*, Sm., but that has the thorax coarsely punctured, the abdomen black apically, &c.

*Parasphecodes hybodin*us, sp. n.

♂.—Length about 10 mm.

Robust for a male; head, thorax, legs, and antennæ black, the tarsi very dark brownish; clypeus with a large transverse pale yellow patch, having a triangular median tooth-like projection, and smaller lateral ones, the outline not unlike that of a *Hybodus* tooth; hair of head and thorax entirely white, the same colour above as below; mandibles black; clypeus shining, with large punctures; front dull; mesothorax and scutellum closely, rather strongly punctured; area of metathorax well-defined, longitudinally plicate; posterior truncation hardly or not defined laterally, its surface hairy; tegulæ large, punctured, dark basally, otherwise light rufous. Wings long, dusky translucent, somewhat reddish; stigma and nervures dark ferruginous; first r. n. meeting second t.-c.; outer nervures hardly weakened; b. n. strongly arched, meeting t.-m., but on outer (apical) side. Abdomen shining, very distinctly punctured, first three segments (except apex of third) bright chestnut-red, beyond this the segments are black, with the hind margins dark brown. The anterior knees are red.

*Hab.* Windsor, Victoria, 1909 (*French*), Froggatt collection, no. 98.

In the table of Smith's species this runs to *P. hilactus*, Sm., differing at once by the dark legs. In the table in *Tr. Am. Ent. Soc.* it runs near *P. froggatti*, differing by the darker legs, ferruginous stigma, &c., and *P. vulneratus*, which is smaller, with more finely punctured thorax.

*Parasphecodes recantans*, sp. n.

♂.—Length 8 mm. or a little less.

Rather slender; head and thorax black, with quite abundant greyish-white hair, the same colour above as below; antennæ very long, black, the flagellum obscurely brownish beneath; clypeus with about the apical half and a median upwardly directed lobe light yellow; labrum ferruginous;

mandibles light yellow in middle ; mesothorax and scutellum very minutely and densely punctured ; tubercles partly red ; area of metathorax not defined, with a rather strong, irregular, finely reticulate sculpture ; posterior truncation dull and hairy ; tegulae pale testaceous. Wings dusky translucent ; stigma and nervures dark rufous ; first r. n. meeting second t.-c. ; outer nervures hardly weakened ; femora black, with the knees, and more or less of a stripe above, red ; tibiae red, the middle pair broadly dusky in middle, the hind ones dusky except at base and apex, becoming black in front ; tarsi clear ferruginous. Abdomen very finely punctured, the first three segments (except apex of third) bright chestnut-red, beyond that black.

*Hab.* Victoria, Feb. 1901 (C. F., Turner collection). British Museum.

In the table of Smith's species this runs to the vicinity of *P. stuchila*, Sm., which has the area of metathorax well defined, the basal half of first abdominal segment black, and the wings clouded at apex. I had taken this for the male of *P. speculiferus*, until I saw the entirely different truncation of metathorax.

*Parasphcodes speculiferus*, sp. n.

♀.—Length 8 mm. or rather less.

Head, thorax, mandibles, antennae, and legs black, the flagellum with a very faint reddish tint beneath toward apex ; hair of head and thorax dull white, with a faint ochreous tint dorsally ; head broad ; clypeus with strong punctures ; mesothorax and scutellum dull, with excessively dense minute punctures ; area of metathorax poorly defined, the basal three-fifths covered with delicate longitudinal striae, the apical part smooth ; metathoracic truncation heart-shaped, well defined, its upper corners broadly rounded, not prominent, its surface smooth and brilliantly shining, with a median groove in which is some long hair ; tegulae dark rich castaneous, with the anterior margin pallid. Wings dusky translucent, the apex a trifle darker ; stigma and nervures dark rufous ; first r. n. meeting second t.-c. ; outer nervures somewhat weakened ; hair on outer side of hind tibia and basitarsus dark fuscous ; middle femur with a brush of light orange hair beneath near base. Abdomen dark castaneous, very finely punctured, more or less blackish apically.

*Hab.* Victoria, Feb. 1901 (C. F., Turner collection). British Museum.

In the character of the sculpture of area of metathorax resembles *P. melbournensis*, Ckll., but that is larger, with the upper lateral corners of metathoracic truncation prominent, the pubescence pale fulvous, &c. In the table of Smith's species it runs to 3, and does not go into any of the divisions. *P. tilachus* differs from it at once by the coarsely punctured thorax, *P. lathius* by the flagellum fulvo-testaceous beneath, *P. taluchis* by the strongly yellowish wings, *P. hillacus* by the clear wings and rufo-testaceous tegulæ.

*Parasphcodes speculiferus*, var. *a*.

♀.—Almost 9 mm. long.

Tegulæ piccous, narrowly whitish in front.

*Hab.* Sydney, N.S.W., at flowers of *Angophora*, Dec. 1, 1910 (*Froggatt*, 105).

I had at first put this aside as distinct, but it has no satisfactory characters.

XXIII.—*Descriptions of new Arachnids of the Orders Solifugæ and Pedipalpi.* By S. HIRST.

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IN the present note four new species of Solifugæ and a new pedipalp are described; two other species which I described in earlier papers are commented upon also. Two of the new species of Solifugæ seem to me to be of especial interest: one of them belongs to the subgenus *Galeodopsis*, Birula—a subgenus which can be recognized from all other Galeodidæ by the presence of two pairs of spines on the second segment of the fourth leg. Hitherto *Galeodopsis* was only known to occur in South-east Persia. The new species is from Tripoli, North Africa. The other interesting new species belongs to the genus *Othoes*, which I founded in February 1911 for a very peculiar Galeodid found in the Anglo-Egyptian Sudan. Unfortunately the locality of this second species of the genus is not known.

*Galeodes (Galeodopsis) tripolitanus*, sp. n.

Closely allied to *Galeodes (Galeodopsis) cyrus*, Poc., but differing from that species as follows:—

*Flagellum* very different in shape, the blade being much

wider. In *G. tripolitanus* the blade is distinctly longer than the stalk of the flagellum, but in *G. cyrus* it is very much longer than the stalk (figs. 1 & 2).

Fig. 1.



Fig. 2.



Fig. 1.—*Galeodes (Galeodopsis) tripolitanus*, sp. n., ♂. Side view of flagellum.

Fig. 2.—Ditto of *G. (G.) cyrus*, Poc.

*Palp*.—Strong spiniform bristles of tibia distinctly longer than those of *G. cyrus*. On the inner side of the ventral surface of the metatarsus there are five spines, three of them being strong and slightly longer than the height of the segment, the others a little shorter and much more slender; on the outer side there are only four spines, two of them being strong; cylindrical bristles of this segment very similar to those which are present in *G. cyrus*.

*Legs*.—There is a slight difference in the appearance of the setæ on the ventral surface of the fourth leg; in the new species these bristles are slightly shorter and stouter than in *G. cyrus* and dark in colour. [Armature of tarsi of legs exactly the same as in *G. cyrus*; middle segment of tarsus of fourth leg with two pairs of spines, as in that species.]

*Colour* yellow. Head-plate darkened in front, but not so extensively as in *G. cyrus*. [The abdomen is much shrivelled, but is yellowish and apparently without any dark band.] Chelicera pale yellow and *without any dark stripes*. Palp similar in coloration to that of *G. cyrus*, the tibia, metatarsus, and tarsus being infusate; the tibia, however, is only deep brown, whilst the metatarsus is black. Legs yellow throughout their length.

*Measurements in mm.*—Total length 30; width of head-plate 8; length of tibia of palp 21.5, of its metatarsus 15.5.

*Material*.—A single specimen of the male sex (in bad condition); collected by Mr. J. I. S. Whitaker at Wali Agarib, just N.W. of Sökna, Tripoli, July 3rd, 1901.

*Note*.—Dr. A. Birula gives a detailed description (Bull. Ac. Sc. St. Petersburg, (5) xxii. p. 262, figs. 1–3, 1905) of a Persian species of *Galeodopsis* which he considers to be *G. cyrus*, Poc. According to his description and figure, the



flagellum of his specimen differs considerably in shape from that of the real *G. cyrus*, however, and is much more like the flagellum of *G. tripolitanus*, sp. n. Although very closely allied both to *G. cyrus* and *G. tripolitanus*, I think that Birula's species should be regarded as distinct, and I propose the new specific name *birulæ* for it.

### Genus OTHOES, Hirst.

This genus can be easily distinguished from *Galeodes* by the much greater length of the terminal part of the claws of the posterior legs. Moreover, the ventral surface of the tibia and metatarsus of the palp is only furnished with fine hairs, spines and strong bristles being entirely absent. Owing to the similarity in the length of their appendages and of the coloration of the palp the species of this genus present a considerable superficial resemblance to those of *Galeodopsis* (subgen. of *Galeodes*), but they differ from them in a number of very important structural characters. The stigmata of the second and third abdominal segments are pectinate above and the basal portion of the claws is hairy in *Othoes*, as in all other Galeodidæ.

#### *Othoes vittatus*, sp. n.

*Colour*.—Head-plate brown, with a yellowish central streak; ocular tubercle black, but it has a pale narrow line in the middle. Dorsal surface of thoracic segments and the tergites of the abdomen deep brown; the sides and ventral surface of the abdomen yellow. Chelicera marked above with three rather narrow brown stripes. Palp very similar in coloration to that of *O. floweri*, the tibia and metatarsus being black and the tarsus also rather strongly infuscated. Legs yellowish.

The difference in structure between this new species and *O. floweri* is not very great. The following is a comparison between them:—

Armature of *chelicera* almost exactly as in *O. floweri*, the only difference being that a minute tooth is present between the two distal teeth in the new species.

*Palp* resembling that of *O. floweri* very closely both in structure and proportions.

*Legs*.—Tarsi of legs of second pair armed with the same number of spines as in *O. floweri*, and the tarsal armature of the legs of the fourth pair is also exactly similar in these two species. Tarsus of third leg with | 1 + 2 + 2 + 2 | 2 |

spines. [Only one of the legs of the third pair of my specimen remains, the other having been broken off, so that this formula needs confirmation.] Metatarsus of fourth leg lacking the most proximal of the three unpaired spines which are present in *O. floweri*.

*Measurements in mm.*—Length of trunk 24; width of head-plate 6; length of tibia of palp 11, of metatarsus of palp 7·25, of fourth leg 44·25.

*Material.*—A single example, of the female sex, without any locality.

*Remarks.*—Very closely allied to *O. floweri*, Hirst, from which it differs chiefly in having the abdomen furnished dorsally with a dark median band.

*Solpuga pugilator*, sp. n.

♂. *Chelicera.*—Basal enlargement of flagellum low and very different in shape to that of *S. venator*, Poc. Free portion of flagellum arising above the second tooth (from the distal end); it is long, but does not reach back nearly so far as the base of the chelicera; near its distal end it has a distinct lateral curvature, whilst the tip is more slender than

Fig. 3.



Side view of flagellum and immovable finger of chelicera of *Solpuga pugilator*, sp. n. A. Dorsal view of the flagellum.

the rest of the free portion of the flagellum and is sharply pointed. Two minor teeth are present between the second tooth from the distal end and the next large tooth, and a single minor tooth between the two large teeth of the movable finger. On its inner side above, some distance in front of the point at which the flagellum is attached, the immovable finger has a minute denticle or granule; its terminal fang is longer than is the case in *S. venator* (fig. 3).

*Palp.*—Cylindrical bristles are present on the ventral

surface of the tibia, metatarsus, and tarsus, but they are most numerous on the metatarsus.

♀.—As in the male, the immovable finger of the *chelicera* has two little teeth between the second and third large teeth, and the movable finger a single little tooth between its two large teeth.

*Colour*.—Head-plate reddish brown except for the anterior margin and the ocular tubercle, which are black. Abdominal tergites deep brown, the integument immediately bordering them being black in the male but brown in the female. Ventral surface of trunk yellow. Chelicera of male reddish brown above and yellowish at the sides, that of the female entirely yellowish. Palp and legs yellow; the malleoli also yellow.

*Measurements in mm.*—♂. Length of trunk 32.5; width of head-plate 8.75; length of palp 40, of its tibia 12.75, of its metatarsus 10.25, of fourth leg 56.25. ♀. Length of trunk 34; width of head-plate 9; length of palp 29, of its tibia 9, of its metatarsus 8, of fourth leg 43.5.

*Material*.—A male (the type) and a female labelled "Zoutpansberg, Transvaal (*J. P. Cregoe*)."

### *Solpuga fordi*, Hirst.

*Solpuga fordi*, Hirst, Ann. & Mag. Nat. Hist. (7) xx. p. 38, figs. 5a, 5b, 5c (1907).

*Material*.—Besides the types (from Lake Baringo) there are specimens of both sexes of this species in the British Museum collection, obtained by a Mr. Simon in Uganda, and also a male specimen labelled "Aios, November 1901."

*Remarks*.—This *Solpuga* is slightly reddish yellow in colour, and the anterior margin of its head-plate has a dark narrow line; the tergites are deep brown in both sexes, and the integument bordering them laterally is dark grey (in the female only?); ventral surface yellowish. In both sexes two minute teeth are present between the second tooth from the distal end and the next large tooth of the immovable finger of the chelicera, whilst a single minute tooth is placed between the two large teeth of the movable finger.

### *Karschia tibetana*, Hirst.

*Karschia tibetana*, Hirst, Ann. & Mag. Nat. Hist. (7) xix. p. 322, figs. 1 & 2 (1907).

*Material*.—Some time after describing this species a number of additional specimens of both sexes from Kamba

Djong, Tibet, were handed over to me. The types were collected at Gyantse.

*Remarks.*—In my description I mention the fact that a little denticle is present on the flagellum at some distance from its distal end. This denticle is very minute and inconspicuous, however; it is drawn too large in the figure. In the female there are usually only two minor teeth between the two large teeth of the movable finger, but sometimes three are present; one or two of the smaller teeth of the immovable finger shown in my figure are absent in some female examples but present in others.

*Eremobates audax*, sp. n.

♂. *Chelicera.*—Immovable finger with a small but distinct elevation close to the basal end above; ventrally it has a longitudinal groove. On each side of the vertical part of the chelicera there is a row of three or four teeth, the uppermost tooth being the largest. Movable finger with the dentition apparently precisely similar to that of *E. affinis*, Krpln. (as figured by Kraepelin in 'Das Tierreich'), a small sharply pointed tooth being present on the anterior side of the principal tooth and another low but elongated tooth situated a little distance in front of it (fig. 4).

Fig. 4.



Side view of chelicera of *Eremobates audax*, sp. n., ♂.

*Palp.*—Distal half of femur with a number of spiniform bristles on the inner side. On the inner side of the tibia below there is present a row of about 5–6 spiniform bristles, two of which are larger than the others, and a little to the outer side of these bristles there is another row of about the same number of very much weaker and shorter spines (bristles); numerous fine cylindrical bristles are also present on the lower surface of the tibia, but they are not so numerous at its proximal end as on the rest of its ventral surface. Metatarsus and tarsus without either spines or strong spiniform bristles, but they are furnished ventrally throughout



their length with very numerous slender cylindrical bristles. Papillæ are absent.

*Legs*.—Metatarsus of fourth leg armed with a row of six spines on the inner side of its ventral surface, and also with an apical spine.

*Colour*.—Head-plate rather deep brown, but with an indistinct central yellowish streak; ventral surface of cephalothorax yellow. Abdomen rather dark brown above, the tergites being very dark; its ventral surface is paler. Chelicera dark yellowish to pale brown in tint. Femur of palp yellowish except at the distal end, which is dark brown; tibia, metatarsus, and tarsus of palp deep brown throughout their length above. Proximal segments of legs and the malleoli yellow; femora of anterior legs brown at the distal end only; the posterior legs have this segment deep brown distally for more than half its length; tibiæ of anterior legs only slightly darkened, but those of the posterior legs are deep brown throughout their length; metatarsi of posterior legs brown at the proximal end; tarsi yellowish throughout.

*Measurements in mm.*—Length of trunk 19, of tibia of palp 9.75, of metatarsus of palp 7; width of head-plate about 5.75.

*Material*.—An adult male example (the type) and an immature example from Mexico (Fry Coll.). Both these specimens are dry and pinned.

*Remarks*.—Closely allied to *E. affinis*, Krpln., and to *E. girardi*, Putnam (both of which are found in Arkansas). The new species differs from the former in the coloration of its appendages and from the latter in the dentition of the movable finger of the chelicera.

*Mastigoproctus formidabilis*, sp. n.

♂. First sternite marked with a pair of very shallow impressions and with a little median impression near the posterior margin also; it is furnished with transverse ridges and granules at the sides and is transversely striate in the middle, except posteriorly, where it is finely punctured. Second sternite very coarsely punctured at the sides and with the usual raised area in the middle. Third sternite with distinct punctures and striæ. Remaining sternites smooth and polished; they have only a very indistinct sculpturing of fine irregular lines, and are furnished with very fine but distinct punctures; close to the lateral margins a few minute granules are present.

*Ommatidia* minute and oval in shape, like those of

*M. giganteus*, Lucas. Fang of *chelicera* very similar in shape to that of *M. giganteus*.

*Palp* much more slender than that of *M. maximus*, Tarnani, especially the tibia and hand, the latter being a little less than twice as long as wide. Trochanter not very strongly wrinkled and granular above; it has five spines above, the outermost one being much the longest (fig. 5);

Fig. 5.



Fig. 6.



Fig. 5.—*Mastigoproctus formidabilis*, sp. n., ♂. Inner margin of trochanter of chela.

Fig. 6.—Ditto, ♀.—Inner margin of trochanter of chela.

the two spines of the ventral surface are well developed, the outer being much the longer. Femur shining and smooth above, except for some granules towards the inner side; the punctures are fine above, but below they are larger and more distinct. Tibia and hand also smooth and polished; the punctures are quite fine and rather sparse on these segments; those on the hand, however, are slightly more distinct than those on the tibia. Tibial apophysis very long and rather slender. A distinct excavation is present at the base of the edge of the immovable finger of the hand, and a slightly enlarged conical granule at the base of the edge of the movable finger. A rather large and sharply pointed tooth is placed on the ventral surface of the hand near to the point of attachment of the movable finger.

♀. *Palp* with its segments less elongate and more distinctly punctured than is the case in the male; its trochanter has six spines above, but the additional (outer) spine is minute and is situated at a little distance from the others; the spine of the angle is the longest, its length being slightly greater than that of the larger of the two outer spines (fig. 6). Immovable finger of normal shape.

*Legs*.—Second segment of tarsus of first leg longer than the third, instead of being shorter than it, as is the case in

*M. proscorpio*, Latr. A spine is present below at the distal end of the tibiæ of the third and fourth legs.

*Colour*.—Trunk dark brown above; its ventral surface is usually a little paler, and the coxæ of the legs and the middle part of the first sternite are reddish. Palp dark brown. Proximal segments of legs, including the femora, rather dark brown or dark reddish brown above; the distal segments reddish.

*Measurements in mm.*—Length of trunk 55·5, of carapace 22·5.

*Material*.—About forty specimens, including numerous adults of both sexes; collected by Mr. Briceno at La Polonia, Venezuela.

*Remarks*.—The male of this species can easily be recognized from that of the other described species of the genus *Mastigoproctus* by the shape of the immovable finger of the hand, &c.

XXIV.—*Descriptions of new Species of Cerithium, Clanculus, and Soletellina.* By G. B. SOWERBY, F.L.S.

*Cerithium vignalii*, sp. n. (Fig. 1.)

Testa elongato-turrita, alba, plus minusve pallide fulvo tincta vel strigata; anfractus 13, planato convexi, costis numerosis trinodulosis longitudinaliter muniti, spiraliter tri-lirati et multi-striati; anfractus ultimus subquadratus,  $\frac{1}{3}$  longitudinis testæ æquans, haud rostratus, spiraliter sex-liratus, uni-varicosus; apertura oblique ovata; labrum crenulatum, extus varicosum; columella arcuata, levis, postice uni-lirata; canalis perbrevis.

Long. 36, lat. 11 mm.

*Hab.* New Caledonia.

A long, narrow, white shell, more or less faintly tinged and streaked between the numerous longitudinal ribs with light brown. The ribs are pretty equally trinodulose, terminating abruptly at the top of the whorls. The whorls (excepting the last) are three-ridged and all are spirally striated, the last having six ridges, of which the three basal ones are more sharply raised than the others.

This species has been compared with *C. armatum* (Phil.), from which it is readily distinguished; the row of nodules against the suture being rounded, scarcely larger than the

other two rows, whereas in *C. armatum* they are much more prominent and angular.

I have pleasure in dedicating this shell to Monsieur L. Vignal, of Paris, who has made a special study of the Cerithidæ, and to whose judgment I submitted specimens before venturing to describe the species as new.



Fig. 1.—*Cerithium vignalii*  
(nat. size).



Fig. 2.—*Clanculus gibbonsi*  
(enlarged).

*Clanculus gibbonsi*, sp. n. (Fig. 2.)

Testa conico-globosa, anguste umbilicata, alba, maculis parvis nigris, interdum confluentibus, conspersa; spira conica, elatiuscula, convexiuscula; anfractus 5, convexiusculi, funiculis 4 creberrime granulosis cingulati; sutura canaliculata; anfractus ultimus  $\frac{2}{3}$  altitudinis testæ æquans, ad peripheriam angulatus, funiculis 2 validis granosis munitus; basis convexa, liris concentricis 7-9 minute granulosis nigro articulatis instructa, area umbilicalis valde plicato callosa; apertura subrotundata, leviter obliqua, intus albo-margaritacea, inerassata, valde lirata; columella irregulariter rugose plicata.

Alt. 9, lat. 8 mm.

*Hab.* Zanzibar.

In form the shell somewhat resembles that of *C. scabrosus* (Phil.), but is much smaller, while the character of the columella and strongly plicate umbilical callus suggest an affinity with *C. guinaicus*, which is a much larger species and very different in form.

*Soletellina (Psammotæa) gibbonsi*, sp. n. (Fig. 3.)

Testa subovalis, fore æquilateralis, paulo inflata, tenuis, sub epidermide purpurascens, concentricè irregulariter lirato rugata, sub lente hic illic subtilissime oblique sculpturata; margo dorsalis anticus declivis, leviter convexus. posticus convexe subtruncatus: latus



anticus rotundatum, posticus suboblique curvatum: margo ventralis leviter arcuatus; umbones depressi, approximati; ligamentum breviculum, elevatum, pone umbones situm. Pagina interna purpurea; impressiones musculari subpyriformes; linea pallii late arcuata; linea cardinalis antice tenuis, postice crassa. Dentes cardinales in utraque valvarum duo, minuti.

Diam. antero-post. 22, umbono-marg. 13, crass. 7 mm.

*Hab.* Zanzibar.

This shell somewhat resembles *S. minor*, Desh., from the Philippines, but more oval in form and differing in other respects.

Fig. 3.



Fig. 4.



Fig. 3.—*Soletellina (Psammotæa) gibbonsi*.

Fig. 4.—*Soletellina (Psammotæa) brevis*.

*Soletellina (Psammotæa) brevis*, sp. n. (Fig. 4.)

Testa subovalis, levissime obliqua, inæquilateralis, depressiuscula, albida purpureo radiata, concentrice leviter rugata; margo dorsalis anticus declivis, leviter convexus, posticus brevior subrecto declivis; latus anticus rotundatum, posticum truncatum; margo ventralis arcuatus; umbones acuti, elatiusculi. Pagina interna purpureo radiata; linea pallii late arcuata. Dentes cardinales in utraque valvarum duo, minuti.

Diam. antero-post. 12, umbono-marg. 10, crass. 5 mm.

*Hab.* Zanzibar.

The type specimen is prettily purple-rayed within and without, but the species varies much in colour, some being rayed only inside and others being dull white without rays.

XXV.—*A new Genus of Opossums and a new Tuco-tuco.*

By OLDFIELD THOMAS.

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GLIRONIA, gen. nov. (*Didelphiidæ*).

General proportions of *Marmosa*. Ears narrower. Tail, instead of being entirely naked beyond a short basal portion,

bushy to the tip, about as in *Petaurus*, the terminal three inches below, however, naked, transversely wrinkled, very much as in some of the smaller Phalangeridæ.

Skull essentially as in *Marmosa*, but the muzzle longer and lower; height from crown of anterior molariform tooth to forehead little more than one-third the palatal length, while it is about one-half in *Marmosa*. Nasals expanded behind. Supraorbital ledges well developed, but not forming angular postorbital processes.

Teeth generally as in *Marmosa*, but the incisors of different proportions.  $I^1$  but little longer than the others and less than any of them in section;  $i^{2-4}$  subequal, rather large,  $i^5$  smaller than they are. In *Marmosa*, and indeed in all other opossums,  $i^5$  is either equal to or larger than the other lateral incisors. Molars small, their shape about as in *Philander*, the last one similarly broadly triangular, and not narrowly as in *Marmosa*. Lower incisors more proclivous than usual and the canine more upright, so that there is a greater gap between their respective tips.

Type:—

*Glironia venusta*, sp. n.

A fawn-coloured opossum with striped face and bushy white-tipped tail.

Size about as in the larger species of *Marmosa*. Fur soft and velvety; hairs of back 7–8 mm. in length. General colour above fawn, with something of the pink tone of "ceru drab" in it. Undersurface grey, the bases of the hairs slaty and their tips greyish white, but on a small patch on the chest the hairs are white to the roots. Head with the maximum development of the black-striped type of coloration, almost equalling *Distechurus pennatus* in this respect; the middle line of the head from nose to occiput greyish white (hairs slaty at base), bordered on each side by a broad black band about half an inch in breadth starting on the side of the nose, passing across the eyes and behind the ears, and ending about level with the back of the skull. Ears naked, oval, narrower than in *Marmosa*, a small greyish patch round their posterior base. Hands and feet dull brownish white. Tail cylindrical, bushy, tapering terminally, very like that of *Petaurus breviceps*, the hairs 14–15 mm. in length halfway down; grey like the body proximally, darker and browner on the third quarter, and then abruptly changing to white on the terminal fourth.

Skull and teeth as described above.

Dimensions of the type (measured by the collector in the flesh) :—

Head and body 160 mm.; tail 195; hind foot 27; ear 25.

Skull\*: condylo-basal length 43·5; nasals, length 19·8, middle breadth 3·4, posterior breadth 6·4; interorbital breadth 7·1; breadth on supraorbital ridges 9·3; breadth of brain-case (c.) 18; height of muzzle from alveolus of secutor 7; palatal length (c.) 23·5; breadth of palate between outer corners of  $m^3$  11·5; combined length of three anterior molariform teeth 7.

*Hab.* Pozuzo, Peru. Alt. 800 m.

*Type.* Adult male. B.M. no. 12. 1. 15. 7. Original number 23. Collected April 1908 by L. Egg. Presented by Oldfield Thomas.

This most beautiful little opossum represents quite a new type in the family Didelphidae, and recalls some of the bushy-tailed Australian Phalangeridae.

*Ctenomys talarum recessus*, subsp. n.

Centre of face not blackened, the hairs there subterminally ringed with drab, as on the rest of the animal. Under surface with white pectoral and inguinal patches. Tail comparatively short, as in true *talarum*, not long as in *C. t. antonii*; its colour drab, the narrow upper crest dark brown, the lower white.

Skull as in *talarum*.

Dimensions of the type (measured on the spirit-specimen) :—

Head and body 155 mm.; tail 54; hind foot 26.

Skull: occipite-nasal length 38; condylo-incisive length 38·5; zygomatic breadth 22·5; nasals 12; interorbital breadth 7·7; upper tooth-series (crowns) 7·8.

*Hab.* Bahia Blanca, Argentina.

*Type.* Adult female. B.M. no. 11. 11. 19. 14. Collected by Emil Weiske. Presented by the Hon. N. C. Rothschild. Two specimens.

This southern form of the Buenos Ayres *Tuco-tuco* has the white axillary and inguinal patches of *C. t. antonii*, combined with the short tail of true *talarum*, while in the absence of blackening on the face and crown and the comparatively light colour of the sides of the tail it differs from both of them.

\* These dimensions must be taken with a little reserve, as the skull has unfortunately been seriously affected by preservatives and is imperfect in various details.

XXVI.—*Descriptions of new Species of Pyralidæ of the Subfamily Pyraustinae.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from p. 174.]

(8 a) *Desmia stenoleuca*, sp. n.

Antennæ of male not excised but with scale teeth above and below beyond middle.

♂. Head, thorax, and abdomen dark brown; palpi white at base; pectus white; legs black and white; abdomen with the ventral surface white and with two white streaks on anal segment above and below. Fore wing dark brown; a white medial bar from below costa to below the cell, its outer edge slightly expanding in and below cell, a small white spot beyond it below vein 2 and a triangular spot on inner margin; a postmedial white bar from costa to vein 4, its outer edge bidentate; cilia white with a black line near base. Hind wing dark brown; an oblique narrow wedge-shaped white medial band from costa to vein 1; cilia white with a black line near base.

*Hab.* W. COLOMBIA, Jiminez, 1 ♂ type. *Exp.* 26 mm.

(10 a) *Desmia melanopalis*, sp. n.

*Ædiodes ploralis*, Druce, Biol. Centr.-Am., Het. ii. p. 262 (part.), nec Guen.

♂. Black-brown; palpi white at base and whitish in front; frons with lateral white lines; throat white; fore tibiæ at base and mid femora at extremity and the tarsi white; abdomen with white dorsal band on second segment, the ventral surface banded with white on basal half. Forewing with white medial band from below costa to vein 1, expanding in cell and with white point beyond it below vein 2; a lunulate white postmedial patch from below costa to below vein 4; cilia with fine white line at base and white tips towards tornus. Hind wing with oblique medial white band, narrowing towards inner margin, confluent below costa with a whitish streak above vein 6 emitting a slight semicircular mark below vein 6 defining the outer edge of a round black spot confluent below with the dark terminal area, the outer edge of band irregular; cilia with fine white line at base and white tips between veins 2 and 1.

*Hab.* COSTA RICA, Candelaria Mts. (*Underwood*), 1 ♂ type. Godman-Salvin Coll. *Exp.* 28 mm.



(10 b) *Desmia lacrimalis*, sp. n.

Hind wing of male with a slight fold from upper angle of cell to termen, which is excised below apex.

♂. Black-brown with a cupreous gloss; base of palpi and throat white; tarsi white; abdomen with slight subdorsal white streaks on anal segment which is very long, the ventral surface white. Fore wing with rather oblique medial white band from subcostal nervure to vein 1 rounded above and below; a white patch beyond the cell from below costa to vein 3, rounded above and below and slightly angled outwards at vein 4; cilia with a fine white line at base. Hind wing with large medial white patch from upper angle of cell to submedian fold, rather attenuate above and rounded below, the fold with pale streak; cilia whitish with a black line through them.

*Hab.* BRAZIL (*Trumbill*), 1 ♂ type. *Exp.* 34 mm.

(11 a) *Desmia geminipuncta*, sp. n.

♂. Head, thorax, and abdomen black-brown, the last with white segmental lines on medial segments and paired streaks on anal segment; palpi white at base; pectus white; legs black and white; ventral surface of abdomen white except anal segment. Fore wing black-brown; a small medial white spot in cell attenuate above, and small rather triangular white spot below origin of vein 2; an oblique curved post-medial white bar from vein 7 to 4. Hind wing black-brown; a white bar across end of cell and small white spot below end of cell; cilia white with a black line through them.

*Hab.* W. COLOMBIA, *Jimenez*, 1 ♂ type. *Exp.* 30 mm.

(11 b) *Desmia mortualis*, sp. n.

*Ediodes intermicalis*, *Druee*, *Biol. Centr.-Am.*, *Het.* p. 261 (part.), nec *Guen.*

♂. Black-brown with a cupreous gloss; palpi at base and throat white; coxæ, bands on fore tibiæ at base and extremity, mid femora at extremity, hind femora at base and extremity and the tarsi white; abdomen with slight dorsal segmental whitish lines, the ventral surface white. Fore wing with narrow medial white bar from subcostal nervure to submedian fold and postmedial patch between veins 7 and 3 with rather irregular outer edge. Hind wing with small white spot in end of cell with bar from it to submedian fold where it becomes obsolescent and ends in a point; a small

spot beyond the cell between veins 6 and 4 with slight point projecting from its lower extremity; cilia fuscous with fine white line at base and whitish tips.

*Hab.* GUATEMALA, Vera Paz (*Champion*), 1 ♂ type. *Exp.* 36 mm.

(11 c) *Desmia stenizonalis*, sp. n.

*Ædiodes intermicalis*, Druce, Biol. Centr.-Am., Het. ii. p. 261 (part.), nec Guen.

♂. Dark brown; palpi at base, pectus, and legs brownish white, the tarsi whiter; abdomen with the ventral surface white. Fore wing with indistinct dark antemedial line from cell to inner margin, a white bar at middle of cell almost conjoined to a small triangular spot below the cell with oblique dark line from its outer side to inner margin; a white postmedial bar between veins 8 and 4 somewhat constricted at middle and with dark line on its outer edge; a fine white line at base of cilia. Hind wing with narrow white band from below middle of costa to above tornus where it narrows to a point, with dark line on its inner edge and dark bar on its outer side beyond the cell; cilia whitish with a dark line through them.

♀. Hind wing with white line on inner edge of the dark line before the medial band from cell to inner margin.

*Hab.* COSTA RICA, Candelaria Mts. (*Underwood*), 1 ♀, Volcan de Atitlan (*Champion*), 1 ♀; PANAMA, Chiriqui (*Champion, Ribbe*), 2 ♂ type, Godman-Salvin Coll. *Exp.* 26 mm.

(11 d) *Desmia deploralis*, sp. n.

♂. Black-brown; palpi at base, pectus and ventral surface of abdomen white; fore tibiae with white band at base; tarsi white; abdomen with dorsal grey bands on first two segments and bifurcate white patch on anal segment. Fore wing with bifid white spot in end of cell and submedian interspace; a white spot beyond the cell between veins 8 and 3, somewhat angled outwards at vein 4 and acute at lower extremity; a fine white line at base of cilia. Hind wing with white band from vein 6 just beyond the cell to above tornus, expanding into an elliptical patch beyond the cell, then narrowing to a sinuous white line; a fine white line at base of cilia; the tornus lobed.

♀. Abdomen with the bands on first two segments whitish; fore wing with a point beyond the lower antemedial spot which is connected with inner margin by a bar; hind

wing with the band broad throughout and with a fine bisinuate black line just before its outer edge from vein 2 to above tornus.

*Hab.* JAMAICA (Kaye), 1 ♀ ; PARAGUAY, Sapucay (Foster), 1 ♂, 1 ♀ type. *Exp.* 28 mm.

(11 f) *Desmia ruptilinealis*, sp. n.

*Ædiodes intermicalis*, Druce, Biol. Centr.-Am., Iket. ii. p. 261 (part.), nec Guen.

♀. Dark brown with a cupreous gloss ; palpi black, white at base ; throat white ; fore tarsi whitish ; abdomen ventrally banded with white except at extremity. Fore wing with small round antemedial white spot in cell ; a medial white spot in cell conjoined to an elliptical spot below the cell ; a postmedial white patch from vein 8 to below 4, attenuate below and with irregular outer edge ; cilia whitish at tips above tornus. Hind wing with narrow white discoidal bar ; a narrow line from origin of vein 2 to middle of inner margin ; cilia with very slight white line at base.

*Hab.* COSTA RICA, Irazu (Rogers), 1 ♀ type, Godman-Salvin Coll. *Exp.* 26 mm.

(12 a) *Desmia tristigmalis*, sp. n.

♂. Brown with a slight cupreous gloss ; palpi at base, throat at sides, tibiae, tarsi, and ventral surface of abdomen yellowish white. Fore wing with quadrate antemedial white spot in cell ; a medial band from subcostal nervure to above vein 1, expanding below the cell and rounded below ; a postmedial patch from vein 8 to 5, its upper extremity rather acute, its outer side somewhat expanding at vein 5, rounded below ; a fine white line at base of cilia. Hind wing with medial white band from below costa to above tornus, broad above, its outer side expanding at vein 5, attenuate below ; cilia whitish with a black line through them.

*Hab.* ECUADOR, Loja, 1 ♂ type. *Exp.* 22 mm.

(13 a) *Desmia tenuizona*, sp. n.

♀. Head, thorax, and abdomen brown with a cupreous gloss ; palpi white in front except towards tips ; tarsi whitish ; abdomen with the ventral surface white. Fore wing brown with a cupreous gloss ; a small antemedial white spot in cell ; a medial quadrate white spot in cell conjoined to a spot below the cell ; a rather conical white postmedial bar from below costa to above vein 3 ; cilia white towards tornus.

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Hind wing brown with a cupreous gloss; a medial white band, narrow towards costa, becoming linear towards inner margin, its inner edge angled below costa, at median nervure and vein 1, its outer edge excurved below costa; cilia with a fine white line at base and white tips.

*Hab.* S.E. PERU, S. Domingo (*Ockenden*), 1 ♀ type. *Exp.* 24 mm.

(3) *Ætholia borneensis*, sp. n.

♂. Head and thorax black-brown with a cupreous tinge, the tegulae and patagia with patches of white; pectus greyish; fore tibiae with white band, the tarsi white ringed with black; abdomen fuscous brown with whitish dorsal patches towards base and rings towards extremity, the ventral surface white. Fore wing black-brown with a cupreous tinge, the basal area variegated with white; antemedial line black, oblique, sinuous; traces of a straight medial line; a quadrate white spot beyond the slight black discoidal lunule partly bisected by a brown streak and striga on upper edge; postmedial line very indistinct, dark with small whitish spot at costa, sinuous, at vein 3 retracted to lower angle of cell; cilia white with black patches at apex, middle, and tornus. Hind wing cupreous black-brown; a small black discoidal lunule; postmedial line indistinct, dark and sinuous to vein 2, then retracted and white and oblique to inner margin; cilia with fine whitish line at base.

*Hab.* BORNEO, Sarawak, Banting, 1 ♂ type. *Exp.* 18 mm.

(2) *Hyperectis apicalis*, sp. n.

♂. Hind wing without bladder-like vesicle below base of costa.

Pure white; medial part of palpi and extremity of fore femora blackish. Fore wing with large rounded cupreous black-brown patch on apical area extending from costa to vein 3; wings semihyaline.

*Hab.* ECUADOR, Cachabé (*Rosenberg*), type in Coll. Rothschild. *Exp.* 28 mm.

(2 a) *Ercta trichoneura*, sp. n.

*Pardomima novalis*, Druce, Biol. Centr.-Am., Het. ii. p. 242 (nec Wlk.).

Hind wing of male on underside with fringe of hair on extremity of vein 2.

♂. Head, thorax, and abdomen brown with a cupreous



tinge; palpi blackish, white at base; pectus, legs, and ventral surface of abdomen white, the legs tinged with brown above. Fore wing cupreous brown, the costal area fuscous; an obliquely curved fuscous antemedial line; an oblique black discoidal bar; postmedial line fuscous, bent inwards below vein 3 to lower angle of cell, then slightly excurved above vein 1; cilia whitish at tips. Hind wing cupreous brown; an indistinct dark postmedial line, bent inwards at vein 3 to near angle of cell; cilia white at tips.

*Hab.* PANAMA, Chiriqui (*Ribbe*), 1 ♀ type, Godman-Salvin Coll. *Exp.* 24 mm.

(5) *Ercta scotialis*, sp. n.

♂. Head, thorax, and abdomen black mixed with some grey; tarsi ringed fuscous and white. Fore wing grey suffused with fuscous and irrorated with black; two black discoidal points; traces of a curved slightly waved postmedial line; a fine pale line at base of cilia. Hind wing semihyaline white; a strigiform black terminal line; cilia whitish with a blackish line through them; the underside with the costal area irrorated with brown, traces of a fuscous discoidal point and postmedial line from costa to vein 5.

*Hab.* MASHONALAND, Salisbury (*Marshall*), 1 ♂ type. *Exp.* 26 mm.

(5 a) *Marasmia aræalis*, sp. n.

Head and thorax whitish tinged with pale fulvous and brown; palpi brown, white at base; sides of frons with black and white streaks; abdomen whitish tinged with fulvous and with slight dorsal fuscous segmental lines on terminal segments, the subterminal segment with oblique black subdorsal streaks, the ventral surface white. Fore wing pale ochreous, the costal area tinged with brown to the postmedial line, the termen slightly tinged with brown; an antemedial fuscous line bent inwards to costa; a black discoidal bar; postmedial line fuscous, slightly curved from costa to vein 2, then retracted to below angle of cell and oblique to inner margin; a rather diffused blackish terminal line; cilia whitish with a blackish line through them. Hind wing pale ochreous; a fuscous discoidal bar with oblique line from it to inner margin near tornus; an oblique line from costa beyond middle to tornus; a slightly diffused black terminal line; cilia whitish with a black line through them.

*Hab.* SEYCHELLES, Mahé (*B. Fletcher*), 1 ♀; QUEENSLAND, Geraldton (*Meek*), 1 ♂ type. *Exp.* 16 mm.

(8a) *Marasmia laticostalis*, sp. n.

♂. Head and thorax ochreous white tinged with red-brown; palpi brown except at base; abdomen yellowish white, faintly tinged with brown at extremity. Fore wing ochreous white, the costal area and cell suffused with reddish brown to postmedial line, the terminal area pale brown with curved inner edge; antemedial line pale brown, curved; a brown discoidal striga; postmedial line pale brown, nearly straight to vein 4, then curved inwards to below end of cell and erect to inner margin. Hind wing ochreous white, the terminal area pale brown with evenly curved inner edge; postmedial line pale brown, straight to vein 3, then bent inwards, and again straight to inner margin.

*Hab.* JAVA, Arjuno (*Doherty*), 2 ♂ type. *Exp.* 22 mm.

(5b) *Rhimphalea anoxantha*, sp. n.

♂. Head and thorax fuscous brown, the frons with whitish bar above, the patagia whitish except at base, the metathorax whitish; palpi with yellowish-white hair in front of first and second joints intersected by a dark streak at middle; throat yellowish white, the pectus white; abdomen white with brown dorsal bar near base, the extremity tinged with yellowish, the sides with black bars on two penultimate segments, the anal tuft black. Fore wing black-brown with a cupreous gloss; two slight yellowish-white streaks below base of costa; an oblique yellowish-white antenodal band from cell to inner margin; a wedge-shaped yellowish-white spot in end of cell, a yellowish-white discoidal bar, and three yellowish-white spots between lower angle of cell and inner margin; yellowish-white streaks beyond upper angle of cell above and below vein 7; postmedial line yellowish white, oblique and dentate on each side from costa to vein 5, then excurved to vein 2 where it terminates; cilia with fine whitish line at base. Hind wing yellowish white; some blackish at base; a large blackish discoidal spot; a slight postmedial line excurved between veins 5 and 2; terminal area blackish, broad at costa, its inner edge excurved at middle, and below vein 2 forming a wedge-shaped patch; cilia white at tips except towards apex.

*Hab.* DUTCH N. GUINEA, Snow Mts., Up. Letchwa R. (*Meek*), 1 ♂ type. *Exp.* 28 mm.

(4) *Hyalea africalis*, sp. n.

Orange; palpi whitish towards base, the second joint above and towards extremity and the base of maxillary palpi blackish; legs streaked with white and fuscous; genital tufts of male black. Fore wing with curved antemedial blackish line, a small spot beyond it in cell, a discoidal line and some suffusion beyond the cell before the postmedial line which is incurved from costa to vein 5, then strongly excurved to vein 2, then retracted to lower angle of cell and slightly excurved again; an indistinct subterminal series of spots, the area beyond them suffused with fuscous expanding on inner area. Hind wing with a fuscous mark at base; a discoidal bar; the postmedial line incurved from costa to vein 5, then bent outwards and minutely dentate to vein 2, then retracted to lower angle of cell and oblique to near tornus; an indistinct minutely dentate subterminal line often with the area beyond it suffused with fuscous; cilia of both wings black at base, grey at tips.

*Hab.* S. NIGERIA, Old Calabar (*Crompton*), 1 ♂, 3 ♀, Sapele (*Sampson*), 1 ♂ type, Warri (*Roth*), 1 ♀, Prince's R. (*Cooper*), 1 ♀. *Exp.* 30 mm.

(1 a) *Leucochroma jamaicensis*, sp. n.

♀. Head, thorax, and abdomen yellow mixed with white; pectus, legs, and ventral surface of abdomen white, the fore tibiae and tarsi banded with yellow. Fore wing white; the costal area yellow; two diffused yellow bands on basal area; quadrate yellow patches defined at sides by fuscous lines in middle and end of cell and below middle of cell; a diffused yellow postmedial band, excurved at middle and incurved below vein 4; a diffused yellow subterminal band defined on inner side by a faint fuscous line, excurved at middle; a yellow terminal band defined on inner side by a slight waved fuscous line; cilia yellow at base, silvery white at tips. Hind wing white; a yellow antemedial band defined by slight fuscous lines from below costa to above inner margin, attenuated at extremities; a waved yellow postmedial band defined on inner side by a fuscous line; a maculate yellow terminal band from apex to submedian fold, defined on inner side by a faint waved fuscous line; cilia silvery white with a slight yellow line near base.

*Hab.* JAMAICA, Runaway Bay (*Walsingham*), 1 ♀ type. *Exp.* 18 mm.

(1 b) *Leucochroma colombiensis*, sp. n.

♀. Head, thorax, and abdomen yellow faintly tinged with fuscous and mixed with some white; pectus and ventral surface of abdomen white. Fore wing white with yellow markings slightly irrorated with fuscous, the costa fuscous towards base; a yellow patch at base not extending to inner margin; an ill-defined antemedial band angled outwards at median nervure and vein 1; rounded patches in and below middle of cell, a rather quadrate discoidal patch with its upper and lower extremities produced, and a round spot below base of vein 2; a black point below vein 3 beyond end of cell; a very ill-defined diffused oblique yellow postmedial band expanding into a large patch at middle; a slight maculate white terminal band defined on inner side by faint fuscous striae. Hind wing semihyaline white; an elliptical yellow discoidal patch; a faint diffused fuscous subterminal band, incurved at discal fold and ending on termen at vein 1; a slight white terminal band from apex to vein 1, faintly defined on inner side by fuscous and with a series of slight fuscous points on termen.

*Hab.* W. COLOMBIA, Jiménez, 1 ♀ type. *Exp.* 26 mm.

(3) *Leucochroma peruvensis*, sp. n.

♂. Head, thorax, and abdomen yellow and white mixed; tegulae orange; palpi white, the second joint with yellow rings at base and extremity; pectus and ventral surface of abdomen white; fore tibiae yellow, white at extremity. Fore wing silvery white; an orange-yellow fascia below base of costa and subbasal patch below the cell; a yellow patch in middle of cell produced above as a streak below costa and with yellow striga below it in submedian interspace; an oblique band from below costa at end of cell to inner margin with a fascia from it in discal fold to the postmedial line, which is obliquely incurved from costa to below vein 4 near termen, then bent inwards to inner margin, above which it expands into a patch; a semicircular orange-yellow patch just before termen from below apex to below vein 4; two slight reddish marks on termen below apex; cilia yellow at base, white at tips. Hind wing silvery white; a curved orange-yellow medial band from below costa to above inner margin; an oblique lunulate patch beyond the cell from below costa to vein 3; a subterminal orange band, expanding towards costa, narrow and excurved at middle, and ending on termen at vein 1; cilia yellow at base, white at tips.

*Hab.* E. PERU, Pozuzo, 1 ♂ type. *Exp.* 22 mm.



(4) *Leucochroma trinitensis*, sp. n.

♀. Head and tegule yellow; thorax and abdomen white, the latter with yellow dorsal bands on third and fifth segments; legs tinged with yellow. Fore wing white; a yellow discoidal spot with fascia from it to the postmedial line, which is oblique from costa to vein 3, then bent inwards to inner margin; a diffused yellow subterminal band from below costa to vein 3. Hind wing white; a curved yellow medial band; a postmedial yellow annulus between veins 4 and 2 connected with costa and inner margin by bands; an oblique yellow band from below costa towards apex to termen at vein 2; a fine yellow terminal line.

*Hab.* TRINIDAD (*Kaye*), 1 ♀ type. *Exp.* 20 mm.

(1) *Syngamia endolasea*, sp. n.

*Syngamia fibulalis*, Hmps. P. Z. S. 1898, p. 613 (part.), nec Guen.

Antennæ of male with the first joint large with scale-tooth on inner side, the base of shaft strongly curved with scale-teeth in the curve covered by a tuft of long black hair on upper side; fore wing with fringe of rough scales on inner area above to beyond middle.

♂. Head, thorax, and abdomen whitish tinged with brown, the tuft of hair on base of shaft of antennæ black. Fore wing whitish suffused with brown especially on costal and terminal areas; a subbasal black point below the costa; an antemedial black spot below the costa with slight curved line from it to inner margin; a black discoidal spot; postmedial line black, curved, expanding into a spot at costa; a blackish terminal line. Hind wing whitish suffused with brown especially on terminal area; a black discoidal point; postmedial line brown defined on each side by white, bent inwards at vein 3 to below end of cell, then oblique to inner margin near tornus where there is a blackish spot; a blackish terminal line, defined on inner side by white towards tornus; cilia whitish with a blackish line through them.

*Hab.* ST. VINCENT (*H. H. Smith*), 1 ♂ type. *Exp.* 16 mm.

(1 a) *Syngamia plicata*, sp. n.

*Syngamia ancidalis*, Hmps. P. Z. S. 1898, p. 644 (nec Snell.).

Antennæ of male with the basal joint dilated with scale-tooth on inner side, the base of shaft strongly curved with scale-teeth in it covered by a large tuft of hair above; fore

wing with some rough scales at base of costal area and a strong fold in submedian interspace.

♂. Head, thorax, and abdomen blackish brown mixed with some ochreous white; the tuft of hair on base of shaft of antennæ blackish; the anal tuft with white lateral marks; pectus, legs, and ventral surface of abdomen whitish, the fore tibiæ banded with fuscous. Fore wing blackish brown with a cupreous gloss; a curved black antemedial line from costa to submedian fold; a black discoidal spot; postmedial line black slightly defined on outer side by white, excurved and minutely waved from costa to vein 3, then bent inwards to below end of cell; cilia with a fine whitish line at base. Hind wing blackish brown with a cupreous gloss; a subbasal white band; a black discoidal spot with white spot beyond it; postmedial line black defined on outer side by white, bent inwards at vein 3 and oblique towards inner margin; a blackish terminal line defined on inner side by white towards tornus; cilia blackish at base, white at tips.

*Hab.* BRAZIL, Amazonas, R. Madeira, Statoro (*Trail*), 1 ♂ type; BRAZIL, São Paulo (*D. Jones*), 1 ♂; PARAGUAY, Sapucay (*Foster*), 1 ♂. *Exp.* 20 mm.

(3 a) *Syngamia ephæa*, sp. n.

Antennæ of male with the basal joint dilated with large tuft of scales above, the base of shaft strongly curved, containing scale-teeth covered by a fringe of black scales above; fore wing with some rough scales at base of costal area.

♂. Head, thorax, and abdomen fuscous brown mixed with whitish; pectus, legs, and ventral surface of abdomen whitish, the fore tibiæ with fuscous band. Fore wing whitish clouded in parts with fuscous brown, the terminal area black-brown with a whitish subapical patch; a curved blackish antemedial line; a blackish discoidal striga; postmedial line blackish, with black spot at costa and defined on outer side by whitish, curved and minutely waved from costa to vein 3, then bent inwards to below end of cell; a blackish terminal line and fine whitish line at base of cilia. Hind wing whitish tinged with brown; a black discoidal point; a blackish shade beyond the cell and from lower angle to inner margin before the postmedial line, which is blackish, incurved below costa, bent inwards at vein 3, then obliquely curved to inner margin near tornus; a fuscous subterminal shade, expanding at apex and bent outwards to tornus; a blackish terminal line; cilia whitish with a blackish line through them.

*Hab.* W. COLOMBIA, San Antonio (*Palmer*), 1 ♂ type. *Exp.* 26 mm.

(5 b) *Syngamia micromphalis*, sp. n.

Antennæ of male with the basal joint dilated, the shaft normal. Fore wing with small glandular swelling at base of costa and tuft of hair from base on underside.

Grey-brown; abdomen with slight whitish segmental rings; palpi at base, pectus, legs, and ventral surface of abdomen white, the fore tibiæ with fuscous band at extremity. Fore wing with slightly curved whitish antemedial line defined by black on outer side; a small black spot in cell and discoidal lunule with somewhat quadrate white spot between them; postmedial line whitish defined by black on inner side, obliquely excurved from costa to vein 3, then retracted to below angle of cell and slightly sinuous to inner margin; a fine white line at base of cilia. Hind wing with blackish discoidal spot; a whitish postmedial line defined by fuscous on inner side, obliquely sinuous from costa to vein 2, then retracted to below angle of cell and oblique to inner margin near tornus; a fine white line at base of cilia.

*Hab.* MEXICO, Jalapa (*Schaus*), 1 ♂ type, Orizaba, type ♀ in Coll. *Schaus*. *Exp.* 20 mm.

(6 a) *Syngamia inflamatalis*, sp. n.

♀. Head, thorax, and abdomen purplish red and orange-yellow; palpi white at base, the second joint black with a red spot; patagia with some fuscous scales; pectus, legs, and ventral surface of abdomen mostly whitish. Fore wing purplish red suffused with fuscous in places; some orange-yellow and crimson on basal area and on inner area before middle; a black-edged semihyaline and yellow antemedial spot from subcostal nervure to submedian fold; similar almost medial and postmedial bands, the former extending from below costa to vein 1, the latter to vein 4; the costa fulvous; the terminal area more crimson with a black line from below costa to below vein 4 with an orange spot on its inner edge; an orange patch at tornus with very irregular inner edge; cilia orange, red and fuscous at apex and middle. Hind wing orange; the costal area white to beyond middle, emitting an antemedial band to vein 1 and a postmedial band to vein 5; a black and crimson patch at base of inner area; an orange discoidal spot edged by crimson lines and with black above, a waved crimson and black line from it to inner margin; a sinuous black and crimson line from below costa beyond middle to tornus; some fuscous on apical part of costa; some crimson on termen, with a black line on its inner side towards costa; cilia yellow, orange at base.

*Hab.* BRAZIL, São Paulo (*Jones*); PARAGUAY, Sapucay (*Foster*), 1 ♀ type. *Exp.* 24 mm.

(9 a) *Syngamia aurantiaca*, sp. n.

♀. Head pale yellow; palpi with the second joint banded with black at base and extremity; antennæ blackish except at base; thorax black; pectus and legs yellow; abdomen orange with black lateral streaks towards extremity, the anal tuft black, the ventral surface yellow. Fore wing deep orange, the base and costal area to beyond middle black; a black antemedial line; a black discoidal lunule conjoined to the black costal area; the terminal area black, expanding at apex and running along inner margin to below end of cell, where it expands into a rounded lobe touching the discoidal lunule; cilia white with a black line near base, tinged with fuscous towards tornus. Hind wing deep orange; a black discoidal bar with oblique line from it to inner margin; a black terminal band expanding at apex and below vein 2; cilia yellowish white to vein 2, then black.

*Hab.* SINGAPORE (Ridley), 1 ♀ type. *Exp.* 16 mm.

(19 a) *Syngamia albiceps*, sp. n.

♂. Head and thorax cupreous brown, the former with white patch on vertex; palpi white at base; pectus and legs ochreous white, the fore tibiae banded with black at extremity; abdomen pale yellow, the penultimate segment with white dorsal band and subdorsal black points, the anal segment with dorsal and lateral white streaks and subdorsal black streaks. Fore wing cupreous brown, the inner half pale yellow from before the antemedial line to the postmedial line confluent with a patch beyond lower angle of cell; a curved blackish antemedial line; a slight black discoidal lunule with small white spot before it; postmedial line blackish defined on outer side by white towards costa, where it expands into a small spot with some white before and beyond it, minutely waved, at vein 2 retracted to below end of cell, then slightly angled outwards in submedian fold; cilia with a fine white line at base. Hind wing pale yellow, the terminal area broadly tinged with cupreous brown; a blackish discoidal striga; postmedial line blackish, bent inwards at vein 2 to below end of cell, then oblique to inner margin; cilia white with a blackish line through them.

*Hab.* SINGAPORE (Ridley), 1 ♂ type. *Exp.* 22 mm.

(21 a) *Syngamia anæmicalis*, sp. n.

♂. Yellowish white; head and thorax tinged with brown; palpi black, the base and third joint white; sides of frons



black. Fore wing with the costa brown ; a brown point in middle of cell and discoidal lunule defined by brown ; an indistinct diffused curved brown postmedial line from costa to vein 2 ; cilia with a dark line near base. Hind wing with brown discoidal lunule ; an indistinct diffused curved brown line from costa beyond middle to vein 2 near termen ; cilia with a dark line near base except towards tornus. Under-side of fore wing with the costal and terminal areas suffused with fuscous brown, the latter broad at costa, narrowing to a point above tornus.

*Hab.* PARAGUAY, Sapucay (*Foster*), 4 ♂ type. *Exp* 20-24 mm.

(2 c) *Samea similalis*, sp. n.

Abdomen of male without lateral tufts of hair.

Head, thorax, and abdomen yellow mixed with red-brown, the last dorsally banded with white : pectus, legs, and ventral surface of abdomen white, the fore legs tinged with red-brown in front. Fore wing yellow suffused with red-brown ; a semi-hyaline yellow spot defined by brown in and below the cell before middle, a dark line from its inner side to inner margin with some yellow before it ; medial yellow spots defined at sides by brown in and below cell and a small spot above base of vein 2 ; postmedial line brown defined on inner side by yellow spots in the interspaces from below costa to above inner margin and on outer side from below costa to vein 2, slightly waved, oblique below vein 4 ; some small blackish spots on apical part of costa ; cilia white with a strigiform dark line through them. Hind wing semihyaline yellow ; a small brown spot in cell ; a brown medial line enclosing a small yellow spot on discocellulars, then sinuous to inner margin ; a sinuous brown postmedial line bent outwards between veins 5 and 3 and with yellow spots beyond it from costa to vein 2 ; the terminal area red-brown ; a dark terminal line ; cilia white with a series of dark striae except at submedian interspace.

*Hab.* BRAZIL, São Paulo (*D. Jones*), 2 ♂, 1 ♀ type. *Exp.* 24 mm.

(2 b) *Samea choristalis*, sp. n.

Head and thorax yellow mixed with brown ; palpi white, blackish at extremity ; abdomen yellow mixed with brown, with white segmental lines and lateral streaks on anal segment ; pectus, legs, and ventral surface of abdomen white, the fore tibiae streaked with brown. Fore wing

semihyaline yellow, the costal area suffused with brown on basal half; an oblique brown line near base followed by a band; a fine antemedial line; quadrate conjoined medial spots in and below cell defined at sides by brown; a quadrate brown discoidal spot with some yellow in centre; postmedial line brown, slightly waved and excurved between veins 6 and 2, then retracted to lower angle of cell and oblique and waved to inner margin, defined on outer side by a series of yellow spots in the interspaces from below costa to vein 2; terminal area brown, the costa yellowish with some small blackish spots; cilia chequered brown and yellow. Hind wing semihyaline yellow; a dark point near base; a black discoidal spot with oblique sinuous line from it to above tornus; postmedial line brown, excurved between veins 5 and 3 and below vein 2 joining the terminal brown band with its inner edge excurved at middle; cilia white chequered with brown except at submedian interspace.

*Hab.* TRINIDAD (*Kaye*), 10 ♂, 1 ♀ type; BR. GUIANA, Demerara (*Rodway*), 2 ♂, 1 ♀. *Exp.* 20 mm.

(2c) *Samea mictalis*, sp. n.

*Samea ecclesiastis*, Druce, Biol. Centr.-Am., Het. ii. p. 244 (part.), nec Guen.

Head and thorax red-brown mixed with some yellow, the vertex of head mostly yellow, the tegulae with yellow streaks; pectus, legs, and abdomen yellow tinged with brown. Fore wing yellow, the costa tinged with brown; two brown lines on basal area; an antemedial brown band forking slightly in cell and not reaching costa, joined at inner margin by an obliquely curved medial brown line with a triangular spot beyond it on discocellulars; postmedial line brown, excurved at middle, defined on outer side by yellow spots in the interspaces from costa to vein 2 interrupted by a slight streak at vein 5; the terminal area brown with a dark point at costa and some yellow at apex; cilia yellow. Hind wing yellow; a brown line near base; a dark discoidal spot with a sinuous line from it to inner margin; a postmedial brown line excurved at middle and below vein 2; a terminal brown band expanding at apex, narrow at middle and extending to the postmedial line below vein 2; cilia yellow chequered with brown.

*Hab.* MEXICO, Tabasco (*H. H. Smith*), 3 ♂, 2 ♀ type, Atoyac (*H. H. Smith*), 1 ♀; GUATEMALA, Vera Paz (*Champion*), 1 ♂, Cerro Zunil (*Champion*), 1 ♂, Zapote (*Champion*), 1 ♀; PANAMA, Chiriqui (*Champion*), 2 ♂, Godman-Salvin Coll. *Exp.* 16-20 mm.

(4) *Samea alophalis*, sp. n.

Head, thorax, and abdomen brown mixed with fuscous; abdomen with segmental white rings; palpi at base, pectus, and legs mostly white, the tarsi banded with black. Fore wing yellowish brown mostly suffused with fuscous; a white point at base and some whitish on basal inner area; a white antemedial band not reaching costa with a waved line on it; a quadrate white spot in end of cell and band from cell to inner margin interrupted by a brown streak on vein 2; postmedial line with some white spots before it beyond the dark discoidal spot and beyond it towards costa and between veins 5 and 2, excurved from costa to vein 2, then retracted to lower angle of cell and traversing the medial white band to inner margin; cilia chequered black and white. Hind wing white; a small discoidal spot; a slightly waved postmedial line excurved between veins 5 and 2 and ending on termen above tornus; a terminal dark band broad at apex and narrowing to a point at vein 1; cilia chequered black and white from apex to vein 2.

*Hab.* MEXICO, Presidio (*Forrer*), 1 ♂, 2 ♀; SURINAM R., Geldersland (*Schaus*), 1 ♀ type, type ♂ in Coll. Schaus. *Exp.* 16 mm.

(13 a) *Bocchoris insulalis*, sp. n.

♀. Greyish fuscous with a cupreous gloss; sides of frons, tegulæ, and patagia streaked with white; palpi at base, pectus, and legs white; abdomen with dorsal and subdorsal series of white spots conjoined towards base, the ventral surface banded with white, anal tuft black at extremity. Fore wing with the base white; the basal area with three oblique white lines, the medial line stronger; an antemedial white band from costa to submedian fold, attenuate below; a fine oblique medial line, incurved below the cell where there is a white spot beyond it; a slight discoidal striga; a wedge-shaped oblique white postmedial patch from costa to vein 4 enclosed in a triangular dark patch bounded by fine lines which meet at submedian fold, the outer line expanding into a small spot at costa; a small lunulate white spot below costa towards apex with a minute wedge-shaped spot on costa beyond it, and a line below it from vein 5 to inner margin towards which it is sinuous, its inner edge dentate towards vein 5; a small spot just before termen above vein 2, the termen blackish from vein 5 to tornus; cilia spotted with white on apical half, white with a black line through them.

on inner half. Hind wing with wedge-shaped white basal patch extending to submedian fold below end of cell and enclosing a brown spot at base and with white streak below its extremity; a discoidal bar confluent with a spot below the cell, forked below; a triangular patch beyond the cell with its extremities produced and with a fine line beyond it from discal to submedian folds, where it becomes a band extending to tornus and with striga before it on vein 1; a postmedial spot from vein 7 to discal fold, with a line below it from vein 4, where it expands into a spot, to submedian fold; termen blackish, with white patch before it between vein 4 and submedian fold and a fine line towards tornus; cilia white with a black line through them.

*Hab.* D'ENTRECASTEAUX Is., Fergusson I. (*Meek*), 1 ♀ type. *Exp.* 22 mm.

(14 a) *Bocchoris labarinthalis*, sp. n.

♂. White, head suffused with brown; tegulae, patagia, and thorax streaked with brown; palpi black, white at base; legs streaked with fuscous; abdomen with slight subdorsal fuscous streaks on two basal segments, dorsal patches on medial and anal segments, and lateral black spots on two terminal segments. Fore wing with basal and subbasal fuscous bands; a curved slightly sinuous antemedial line connected below the cell by fuscous suffusion with an oblique slightly sinuous medial line which again is connected below costa with a discoidal lunule and the fuscous edge of a white band from costa to vein 2, its outer edge strongly indented at middle and its lower extremity connected with inner margin by a fuscous patch, a small fuscous spot before it below end of cell; these markings followed by a white band before the obliquely curved fuscous postmedial line bent outwards to costa; apical area suffused with fuscous to vein 3; cilia tinged with fuscous and with dark line through them, wholly white towards tornus. Hind wing with oblique somewhat diffused fuscous antemedial line acutely angled inwards on medial nervure; a somewhat diffused line from middle of costa to tornus, angled inwards at discal fold, acutely angled inwards at vein 2, then slightly waved; a fine slightly curved line from costa beyond middle to tornus; an apical fuscous patch from costa to vein 3 followed by a fine terminal line; cilia white with a fuscous line through them, wholly tinged with fuscous towards apex.

*Hab.* S. NIGERIA, Lagos (*Strachan*), 2 ♂ type, Ebute Meta (*Boog*), 2 ♂. *Exp.* 20 mm.



(25 a) *Bocchoris rufiflavalis*, sp. n.

♀. Head and thorax rufous mixed with yellow; abdomen white, with rufous segmental lines expanding into lateral patches; palpi at base, pectus, greater part of legs, and ventral surface of abdomen white. Fore wing yellow suffused with rufous; an antemedial yellow spot below the cell defined by brown, a small V-shaped brown mark in cell just beyond it with yellow centre; a medial yellow patch from subcostal nervure to vein 1, defined by brown and expanding below the cell; a yellow band beyond the cell from below costa to vein 2, expanding somewhat at middle, defined on inner side by brown and on outer by the postmedial line which is incurved below costa, excurved between veins 5 and 2, then retracted to lower angle of cell and sinuous to inner margin, with series of small yellow spots beyond it; some slight yellow marks on termen; cilia chequered yellow and rufous. Hind wing yellow; a small rufous spot in cell and elliptical discoidal annulus; postmedial line rufous, incurved below costa, bent outwards between veins 5 and 2, then oblique; a curved crenulate subterminal line, the apical area suffused with rufous; a terminal rufous line and a line through the cilia.

♂. Fore wing with the medial spot in cell separate from the patch below cell; the patch beyond the cell larger; the postmedial line waved and not incurved below costa, with a series of rufous-edged spots beyond it between veins 7 and 2 and the inner area yellow; two well-developed subapical yellow spots. Hind wing with the postmedial line retracted at vein 2 to lower angle of cell; the apical area not suffused with rufous, with yellow spots defined by the rufous veins.

*Hab.* MADAGASCAR, Betsileo (*Cowan*), 1 ♂, 1 ♀ type. *Exp.* 20 mm.

(5 a) *Pilocrocis cuprealis*, sp. n.

♂. Head, thorax, and abdomen dark brown with a cupreous tinge; pectus and ventral surface of abdomen whitish; wings uniform dark brown with a bright cupreous gloss.

*Hab.* NIGERIA, Sapele (*Sampson*), 1 ♂ type. *Exp.* 34 mm.

(5 b) *Pilocrocis eurypalpalis*, sp. n.

Palpi of male with a very broad, short, quadrate tuft at base of third joint and small pointed tuft at extremity; antennæ with process from basal joint and the base of shaft

excised; patagial tufts extending far beyond metathorax and with large dark scales on upper edge; hind legs with large tuft of black hair on tibiae above and fringe of white hair on tarsus; pectus with tuft of long hair from origin of fore wing; the retinaculum formed by a large fan of scales.

♂. Cupreous brown with a slight purplish gloss; sides of frons and vertex of head with some white scales; palpi below, pectus, legs, and ventral surface of abdomen white; fore femora and coxæ yellowish, black spots on coxæ and bands on tibiae; the tuft on hind tibiae black; anal tuft ochreous. Fore wing with dark antemedial line angled on median nervure; a black point in middle of cell and discoidal lunule; the postmedial line bent outwards between veins 5 and 2, then retracted to below end of cell; cilia grey at tips. Hind wing with discoidal spot; the postmedial line excurved between veins 5 and 3, then retracted to below end of cell and oblique to near tornus; a dark terminal line; cilia black at base, white at tips.

*Hab.* COSTA RICA (*Underwood*), 1 ♂ type; COLOMBIA, Papayan (*Lehmann*). *Exp.* 32 mm.

(5 c) *Pilocrocis goniopalpia*, sp. n.

Palpi of male with the second joint broadly scaled, the scaling at extremity above produced over the third joint which is triangularly scaled and set on at an angle; antennæ with the shaft excised at base; patagia with a tuft of hair at extremity extending far beyond metathorax; fore wing with fan of scales in middle of cell on underside.

♂. Head and thorax red-brown, the back of head with some whitish; palpi white at base; pectus and legs white, the fore coxæ at base and tibiae at extremities with black bands; abdomen reddish brown, the genital tufts ochreous, the ventral surface white. Fore wing cupreous red-brown, an indistinct dark antemedial line, oblique from costa to submedian fold; a slight black discoidal lunule; an indistinct dark postmedial line excurved from vein 6 to 2, then retracted to lower angle of cell and again excurved; a terminal series of blackish points and a fine whitish line at base of cilia. Hind wing cupreous red-brown; an oblique blackish discoidal bar; postmedial line indistinct, dark, oblique to vein 2, then retracted to below angle of cell and oblique to tornus; a rather punctiform blackish terminal line; cilia whitish with a dark line through them.

*Hab.* COLOMBIA, Minea (*H. H. Smith*), 1 ♂ type. *Exp.* 28 mm.

(7 a) *Pilocrocis fumidalis*, sp. n.

Antennæ of male with scale-tooth from basal joint, the shaft ciliated.

♂. Head, thorax, and abdomen fuscous brown; palpi rufous in front; pectus, legs, and ventral surface of abdomen whitish. Fore wing fuscous brown; an indistinct fuscous spot towards end of cell and discoidal lunule; postmedial line fuscous, very minutely waved, excurved from costa to vein 2, then retracted to below angle of cell and erect to inner margin; a fine pale line at base of cilia. Hind wing fuscous brown; a slight dark discoidal spot; traces of a fuscous postmedial line bent outwards between veins 5 and 2, then retracted to below angle of cell; a slight pale line at base of cilia. Underside of both wings grey, with the postmedial line maculate and more distinct.

♀ much paler reddish brown; wings with the markings more distinct; the underside whitish, with the terminal area suffused with red-brown except on inner area of hind wing.

*Hab.* BORNEO, Brunei, 1 ♂ type; SANGIR (*Doherty*), 1 ♀. *Exp.*, ♂ 42, ♀ 46 mm.

(8 a) *Pilocrocis dithyralis*, sp. n.

Cupreous brown; palpi below, pectus, and abdomen below white; legs pale brown, with black band on fore tibiæ. Fore wing with hyaline white spot below median nervure at origin of vein 2 and more prominent small quadrate spot beyond the dark discoidal spot.

*Hab.* BR. GUIANA, Potaro R. (*Kaye*), 1 ♀ type; AMAZONS, R. Demerara. *Exp.* 32 mm.

(8 b) *Pilocrocis monothyrallis*, sp. n.

Cupreous brown; palpi below, pectus, legs, and ventral surface of abdomen white; fore tibiæ and tarsi with blackish bands. Fore wing with dark spots in end of cell and on discocellulars with whitish spot between them; an obscure dark postmedial line bent outwards and minutely dentate between veins 5 and 3, then retracted to below end of cell. Hind wing with dark discoidal bar; the postmedial line very indistinct, bent outwards and minutely dentate between veins 5 and 3, then retracted to below end of cell.

*Hab.* PANAMA, La Chorrera (*Dolby-Tyler*), 1 ♀; BR. GUIANA, Berg-en-daal (*Ellacombe*); FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♀ type, Cayenne (*Schaus*), 2 ♀. *Exp.* 40 mm.

(9 b) *Pilocrocis femoralis*, sp. n.

Antennæ of male normal ; fore tibiæ with tufts of long curved hair.

♂. Head, thorax, and abdomen brown ; palpi in front, pectus, and legs pale reddish brown ; abdomen with the ventral surface white. Fore wing cupreous brown, with a purplish gloss on costal half. Hind wing uniform cupreous brown.

*Hab.* BR. GUIANA (*Kaye*), 1 ♂ ; PERU, Rio Colorado (*Watkins and Tomlinson*), 1 ♂ type. *Exp.* 40 mm.

(12 b) *Pilocrocis hypoleucalis*, sp. n.

*Stenomelas agavealis*, Druce, Biol. Centr.-Am., Het. ii. p. 242 (nec Wlk.).

*Omiodes roseinalis*, Druce, Biol. Centr.-Am., Het. ii. p. 253 (part.).

Fore tarsi of male with large tuft of hair on first joint below ; fore wing with swelling at base of costa and tuft of long hair on underside ; patagia with tufts of long hair. Head and thorax brown, the patagial tufts slightly tinged with rufous ; palpi blackish, white below ; abdomen grey-brown slightly tinged with rufous ; pectus, legs, and ventral surface of abdomen white, the extremity of fore tibiæ and tuft on first joint of tarsus fuscous. Fore wing grey-brown with a slight cupreous gloss, the costal area rather darker ; an indistinct slightly curved antemedial line ; a small discoidal spot ; an indistinct postmedial line nearly straight from costa to vein 2, then retracted to below angle of cell and again excurved. Hind wing glossy grey-brown ; a slight discoidal spot ; an indistinct postmedial line, excurved from costa to vein 2, then retracted and ending at inner margin beyond middle ; cilia white with a brown line at base ; the underside white, the costa faintly tinged with rufous.

*Hab.* MEXICO, Tabasco, Teapa (*H. H. Smith*), 4 ♂, 2 ♀ ; PANAMA, Chiriqui (*Champion*), 1 ♂, Godman-Salvin Coll. ; JAMAICA, Castletown (*Kaye*), 1 ♂, 1 ♀ type. *Exp.* 30-32 mm.

(12 d) *Pilocrocis melangnatha*, sp. n.

Hind tibiæ of male very short, the medial spurs absent, a tuft of long black scales from pectus at base of hind legs.

♂. Head, thorax, and abdomen pale rufous ; palpi and frons black ; femora and base of tibiæ with some black. Fore wing pale rufous, the costa whitish to towards apex ; a



subbasal black point above inner margin; antemedial line slight, black, oblique from below costa to submedian fold, then slightly incurved; a black point in middle of cell and discoidal striga; postmedial line black, highly crenulate and with black points on inner side at the veins, bent inwards at vein 2 and slightly excurved in submedian interspace; a terminal series of black strigæ. Hind wing pale rufous; an oblique black discoidal bar; postmedial line black, arising below costa, crenulate and with black points on its inner side at the veins between veins 5 and 2, then waved; a terminal series of black strigæ; cilia whitish at tips.

*Hab.* DUTCH N. GUINEA, Mimika R. (*Wollaston*), 2 ♂ type. *Exp.* 32 mm.

(14 a) *Pilocrocis plicatalis*, sp. n.

Fore wing of male with strong costal fold on underside extending to beyond middle.

♂. Head, thorax, and abdomen dark brown; pectus, femora, tarsi, and ventral surface of abdomen white. Fore wing cupreous brown strongly shot with purple; traces of a dark antemedial line; a slight dark discoidal bar; postmedial line very indistinct, slightly excurved between veins 5 and 2, then retracted to lower angle of cell and obliquely incurved to inner margin. Hind wing cupreous brown; a fine pale line at base of cilia followed by a dark line.

*Hab.* BR. GUIANA, Rockstone (*Kaye*), 1 ♂ type. *Exp.* 34 mm.

(16 b) *Pilocrocis pterygodia*, sp. n.

Head, thorax, and abdomen ochreous; palpi black above, white below; fore tibiæ with black band at extremity; abdomen with small subdorsal black spots on third segment, the ventral surface white. Fore wing ochreous tinged in parts with brown; a black point near base of inner margin; antemedial line blackish, somewhat oblique from costa to submedian fold; a small black spot in middle of cell and somewhat lunulate discoidal spot; postmedial line blackish, incurved from costa to vein 5, bent outwards and slightly waved between veins 4 and 2, then retracted to below end of cell and bent outwards to inner margin; a faint minutely waved fuscous subterminal line and slight terminal shade; a fine fuscous line near base of cilia. Hind wing ochreous; a small black discoidal spot; postmedial line fuscous, minutely waved, incurved from below

costa to vein 5, bent outwards to vein 2, then retracted to below end of cell and oblique to above tornus; a faint minutely waved fuscous subterminal line, fuscous terminal shade, and fine fuscous line near base of cilia.

*Hab.* GOLD COAST, Kumasi (*Whiteside*), 1 ♀; UGANDA, Ruwenzori (*Wollaston*), 1 ♀; MASHONALAND, Salisbury (*Marshall*), 1 ♀; TRANSVAAL, White R. (*Cooke*), 1 ♂ type. *Exp.* 26 mm.

(17 a) *Pilocrocis reniferalis*, sp. n.

♀. Head, thorax, and abdomen grey-brown; palpi at base, pectus, legs, and ventral surface of abdomen white, the fore legs tinged with rufous, the extremity of tibiae fuscous. Fore wing brown with a cupreous gloss; an indistinct oblique diffused antemedial line; a faint spot in middle of cell; a faint discoidal reniform spot defined by fuscous; an indistinct diffused postmedial line, somewhat incurved below costa, excurved between veins 5 and 2, then retracted to lower angle of cell and straight to inner margin. Hind wing brown with a cupreous gloss; a faint oblique discoidal striga and very indistinct postmedial line excurved between veins 5 and 2; cilia greyish at tips, the underside grey.

*Hab.* JAMAICA, Castletown (*Kaye*), 1 ♀ type. *Exp.* 34 mm.

(19 a) *Pilocrocis xanthozonalis*, sp. n.

Black-brown with a purplish gloss; vertex of head, first joint of palpi, and front of pectus rufous; abdomen white below. Fore wing with broad straight oblique yellow band from costa just beyond middle to termen from vein 2 to tornus.

*Hab.* BR. GUIANA; FR. GUIANA, St. Jean Maroni, 1 ♂ type. *Exp.* 42 mm.

(22 a) *Pilocrocis melastictalis*, sp. n.

Head and thorax fuscous brown; palpi blackish, white below; pectus and legs white, the fore tibiae with black band at extremity, the mid tibiae black above at base; abdomen greyish fuscous, the ventral surface white. Fore wing fuscous brown; an oblique blackish antemedial line bent inwards to costa; a small black spot in middle of cell and black discoidal lunule; postmedial line blackish, oblique from costa to vein 4, excurved to vein 2, then bent inwards to below end of cell and erect to inner margin;

a slight dark terminal line, a fine pale line at base of cilia. Hind wing greyish brown; a slight black discoidal lunule; postmedial line fuscous, excurved between veins 5 and 2, then oblique to inner margin; a slight dark terminal line; a fine pale line at base of cilia; the underside grey-white.

*Hab.* MASHONALAND, Salisbury (*Marshall*), 1 ♀; NATAL, Durban (*Leigh*), 1 ♂ type. *Exp.* 32 mm.

(22 c) *Pilocrocis glaucitalis*, sp. n.

Head, thorax, and abdomen brown with a greyish gloss; palpi black above, white below; pectus, legs, and ventral surface of abdomen white; fore tibiæ banded with black at extremity. Fore wing brown with a greyish gloss; a dark antemedial line slightly defined by whitish on inner side, oblique from costa to vein 1; a dark point in middle of cell and black discoidal lunule; postmedial line dark, defined by white on outer side, more strongly from costa to vein 5 and between vein 2 and submedian fold, bent outwards between veins 5 and 2, then retracted to below angle of cell and again excurved; a fine pale line at base of cilia. Hind wing brown with a greyish gloss; a slight oblique black discoidal bar; postmedial line dark slightly defined by grey on outer side, bent outwards between veins 5 and 2, then retracted to below angle of cell and oblique to above tornus; a fine black terminal line; a fine white line at base of cilia followed by a dark line; the underside grey-white, the postmedial line more distinct and minutely waved.

*Hab.* NATAL, Durban (*Leigh*), 1 ♂, 1 ♀ type. *Exp.* 30 mm.

(29 b) *Pilocrocis leucochasma*, sp. n.

♂. Head and thorax grey-brown mixed with whitish; palpi whitish with a fuscous band at extremity of second joint; pectus and legs whitish, the tibiæ suffused with fuscous; abdomen grey suffused with fuscous brown, the ventral surface whitish except at extremity. Fore wing pale grey-brown; traces of a dark antemedial line slightly angled outwards at median nervure; a round grey-brown spot in middle of cell with some whitish before it and a quadrate whitish patch in end of cell before the blackish discoidal bar with whitish line at middle; an indistinct whitish postmedial line excurved to vein 2 and with black suffusion before it, then retracted to lower angle of cell and again bent outwards with some blackish before it; a terminal series of blackish striæ; cilia with a fine white

line at base followed by a brown line. Hind wing whitish tinged with grey-brown, the terminal area grey-brown narrowing to tornus; a blackish discoidal bar with oblique diffused blackish band from it to tornus; a diffused blackish postmedial patch between veins 7 and 2; a blackish terminal line; cilia with a fine white line at base followed by a brown line.

Ab. 1. Fore wing with the suffusion before the postmedial line from costa to vein 2 rufous.

*Hab.* N.E. PERU, Huancabamba, 2 ♂ type. *Exp.* 26 mm.

(32 b) *Pilocrocis rufescens*, sp. n.

Head whitish tinged with rufous; palpi white at base; thorax and abdomen yellow suffused with rufous, the latter yellower at base and extremity; pectus, legs, and ventral surface of abdomen white, the fore tibiae and tarsi banded with fuscous. Fore wing rufous with a yellowish tinge; an indistinct diffused oblique fuscous antemedial line; a fuscous discoidal spot; postmedial line fuscous, excurved and waved between veins 6 and 3, then bent inwards to lower angle of cell and oblique to inner margin; cilia fuscous, whitish at tips. Hind wing yellowish suffused with rufous especially towards termen; cilia whitish at tips.

*Hab.* BAHAMAS, Nassau (*Bonhote*), 4 ♂, 2 ♀ type. *Exp.* 24-28 mm.

(32 g) *Pilocrocis holoxantha*, sp. n.

♀. Head and thorax ochreous yellow tinged with rufous especially on the tegulae and patagia; palpi white at base; pectus, legs, and ventral surface of abdomen ochreous white. Fore wing yellow tinged with rufous on costal area. Hind wing uniform pale yellow.

*Hab.* JAMAICA (*Kaye*), 1 ♀ type. *Exp.* 36 mm.

(35) *Pilocrocis dichocrosialis*, sp. n.

♂. Orange-yellow; palpi with the end of second joint and the third joint black; tegulae with triangular dorsal patch and black spots behind; metathorax edged with black; fore tibiae banded with black. Fore wing with paired dorsal black spots on second segment and dorsal bands on the segments beyond it, and some sublateral points. Fore wing with black spot at base of costa; some diffused black on inner margin near base; an antemedial spot below costa and curved line from median nervure to inner margin; a black spot in middle of cell and discoidal bar; the postmedial line indistinct, excurved from costa to vein 3, then



incurved with prominent black spots at costa and inner margin and with a broad band of fuscous suffusion beyond it except at costa. Hind wing with slightly sinuous medial black line with a broad band of fuscous suffusion beyond it.

*Hab.* ZAMBESIA, Loangwa R., Mpeta (*Coryndon*), 1 ♂ type. *Exp.* 26 mm.

(37) *Pilocrocis lactealis*, sp. n.

♀. Yellowish white; palpi fulvous except at base; tegulæ and shoulders tinged with fulvous. Fore wing with the costa slightly tinged with fulvous at base, the veins with slight dark streaks. Underside of fore wing with slight dark discoidal lunule; termen of both wings slightly tinged with fuscous.

*Hab.* BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♀ type. *Exp.* 32 mm.

(1 b) *Ulopeza phæothoracica*, sp. n.

♂. Head yellowish white; antennæ dark brown; thorax and abdomen dark cupreous brown; pectus pale brownish; fore and mid tarsi yellowish white, the hind tibiæ and tarsi banded black and white; ventral surface of abdomen white except towards extremity. Fore wing dark cupreous brown, with an oblique triangular patch from costa to just beyond lower angle of cell, ochreous above, whitish below. Hind wing cupreous brown with a fine pale line at base of cilia.

♀. Thorax and basal half of fore wing pale reddish brown.

*Hab.* GOLD COAST, Kumasi (*Whiteside*), 1 ♂, 1 ♀; S. NIGERIA (*Sampson*), 1 ♂ type. *Exp.* 24 mm.

(1 c) *Ulopeza flavicepsalis*, sp. n.

Thorax of male with ridges of large scales; legs normal.

♂. Head and tegulæ orange-yellow; antennæ black; thorax pale brown with a metallic gloss; legs streaked with yellow, the tarsi yellow; abdomen brown, the first two segments with orange dorsal patches, the ventral surface yellowish white. Fore wing brown, with large lunulate white postmedial patch between veins 8 and 3. Hind wing brown, with large elliptical white postmedial patch between veins 5 and 2.

*Hab.* CAMEROONS (*Sjostedt*), 1 ♂ type. *Exp.* 24 mm.

(2 b) *Ulopeza junctilinealis*, sp. n.

♀. Head and thorax yellow slightly tinged with rufous; shoulders with rufous stripes; abdomen yellow dorsally suffused with rufous except at base; pectus, legs, and ventral

surface of abdomen except at extremity white; fore tibiæ banded with black, mid tibiæ streaked with black. Fore wing yellow; a subbasal rufous line curving round at costa and joining the antemedial line which is excurved to submedian fold, then incurved; a point in middle of cell and discoidal bar; postmedial line rufous, rather diffused and almost straight from costa to vein 2, then retracted to origin of vein 2, and angled inwards on vein 1 almost to antemedial line which it also almost meets at inner margin; terminal area rufous with yellow spot beyond the postmedial line at costa; cilia dark brown. Hind wing yellow; a diffused blackish spot below lower angle of cell; the inner area broadly suffused with brown except at base; the apical area black-brown from costa to vein 2, narrowing at costa, and defined on inner side between veins 6 and 2 by the diffused dark postmedial line which is excurved between veins 5 and 2; cilia with a slight pale line at base.

*Hab.* BALI (*Doherty*), 1 ♀ type. *Exp.* 26 mm.

(2c) *Ulopeza nigricostata*, sp. n.

♀. Head, thorax, and abdomen orange-yellow; antennæ black except basal joint; abdomen with some brown at extremity. Fore wing orange-yellow, the costa fuscous brown with a cupreous gloss except towards base, the terminal area broadly fuscous brown with a cupreous gloss. Hind wing yellow, the terminal area fuscous brown with a cupreous gloss.

*Hab.* S. NIGERIA, Warri (*Roth*), 1 ♀ type. *Exp.* 22 mm.

(5) *Ulopeza sterictodes*, sp. n.

♂. Head and thorax dark brown, the vertex of head ochreous yellow; pectus whitish mixed with brown; abdomen dark brown mixed with some greyish, especially at base, the ventral surface whitish. Fore wing dark brown with a slight olive tinge, the medial area greyish except at costa, some grey at base of inner margin; antemedial line black slightly defined on inner side by grey, excurved to median nervure and incurved in submedian interspace; a small black annulus in middle of cell and larger discoidal annulus; postmedial line blackish defined on outer side by grey, forming a rounded blackish patch below costa, excurved and minutely dentate between veins 5 and 2, then bent inwards to below end of cell and forming a diffused spot in submedian interspace; a terminal series of small greyish spots. Hind wing grey-white, the terminal area fuscous

brown, broadly at costa, narrowing to a point at tornus; a fuscous point in middle of cell and rather diffused discoidal spot, postmedial line rather diffused, fuscous defined on outer side by grey, minutely dentate, excurved below costa and bent inwards at vein 2 to below end of cell; a terminal series of small whitish spots; cilia chequered fuscous and whitish.

*Hab.* BR. N. GUINEA, Mambare R., Biagi (*Meek*), 1 ♂ type. *Exp.* 36 mm.

(7) *Ulopeza denticulalis*, sp. n.

Antennæ of male normal.

♀. Head, thorax, and abdomen red-brown; pectus, legs, and ventral surface of abdomen white; fore coxæ, femora, and tibiæ brown in front. Fore wing red-brown; a dark antemedial line oblique from costa to submedian fold, then sinuous; a small hyaline bar in middle of cell defined by black; a bifid hyaline discoidal spot defined by black, with slight hyaline streak above base of vein 7 and two hyaline points beyond lower angle of cell, the costal area above end of cell yellowish to just beyond the postmedial line, which is black, forming the outer edge of the hyaline spots, at vein 2 retracted to below end of cell, then sinuous to inner margin; a terminal series of black points. Hind wing greyish brown; a rather punctiform dark postmedial line bent outwards and minutely dentate between veins 5 and 2; a terminal series of dark striæ; cilia with fine pale line at base; the underside whitish tinged with brown, the postmedial line formed of small black spots.

♂. Fore wing with the hyaline bar in cell and bifid discoidal spot much reduced, the streak above vein 7 and points beyond lower angle absent.

*Hab.* TRANSVAAL, White R. (*Cooke*), 1 ♀; NATAL, Durban (*Gooch, Leigh*), 2 ♂, 2 ♀ type. *Exp.* 34 mm.

[To be continued.]

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XXVII.—*Mammals of the Panyam Plateau, Northern Nigeria*.—II. By OLDFIELD THOMAS.

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IN the 'Annals' for May 1911 I published a list of some mammals collected on the Panyam Plateau in Bauchi Province, Northern Nigeria, by the Rev. George T. Fox and his

brother Mr. John C. Fox. Since then a further collection from the same region has been presented to the National Museum by the former, and I now give a list of it.

As before, there are a number of novelties in the collection, and in the cases of several of the animals a very considerable increase in the known ranges of the genera has to be recorded. Thus the genera *Dendromus*, *Steatomys*, and *Acomys* all have a large extension of their range to be noted.

Nearly all the present collection is from Panyam, 4000', and this place is to be understood when no locality is mentioned in the list. A few odd specimens are from Mr. J. C. Fox's locality, Kabwir, 2700'.

1. *Epomophorus gambianus*, Og.

♀. 110. Kabwir.

2. *Erinaceus* sp.

♂. 80 (young).

3. *Tatera kempi*, Wrought.

♂. 54, 66; ♀. 23, 34, 46, 67.

These specimens agree precisely with *T. kempi* in colour and general cranial characters; but their interparietal more approaches the narrow shape found in *T. gambiana* and others, instead of the peculiar broad (antero-posteriorly) bone which occurs in the type of *kempi*. But until more specimens of the latter are obtained from S. Nigeria it is not possible to judge of the constancy of this character, and I provisionally use the name for Mr. Fox's gerbil.

4. *Taterillus nigeriæ*, 'Thos.

♂. 26, 39, 60, 87; ♀. 19, 22, 27, 28, 49, 59.

Averaging rather smaller than the Kabwir specimen on which the species was founded.

5. *Dendromus nigrifrons*, 'True.

♂. 56, 61; ♀. 55, 57 (young).

Distant as is the type locality of *D. nigrifrons*, I can find no character to justify the distinction of the Nigerian tree-mouse from it. The range of the species would therefore extend from Nigeria through East Africa to the Chirinda Forest, Rhodesia, whence Mr. Swynnerton sent some specimens to the British Museum in 1908.



6. *Steatomys caurinus*, sp. n.

♂. 21 (yg.), 63; ♀. 24, 35, 41, 47, 62, 68, 69.

A *Steatomys* with large skull but small teeth. Mammary at least 12.

Size fairly large. General colour the usual brownish fawn, darker along the dorsal area, clearer along the sides. Under surface pure sharply defined white. Ears brown, their edges whitish. Hands and feet whitish, a variable patch of fawn or brown extending along the metatarsus. Tail of medium length, brown above, whitish below. Mammary apparently 12 in number.

Skull nearly as large as in *S. boeyei*, the large Angolan species, but the teeth conspicuously smaller, not larger than in *S. pratensis*. Palatal foramina widely open, but as a consequence of the small size of the teeth the hinder edge of the former is only level with the first lamina of  $m^1$ , and for the same reason there is a greater distance than usual between the back of the molars and the hinder edge of the palate.

Dimensions of the type (measured in the flesh) :—

Head and body 100 mm.; tail 54; hind foot 19; ear 19.

Skull: greatest length 27.5; condylo-incisive length 26; zygomatic breadth 13; nasals 11; interorbital breadth 4.2; breadth of brain-case 11; palatilar length 12.3; diastema 8.1; palatal foramina  $5.5 \times 3.1$ ; upper molar series 3.7.

Type. Adult female. B.M. no. 12.1.16.24. Original number 47. Collected 13th July, 1911.

This is by far the furthest north-westwards that the genus *Steatomys* has been recorded. The species may be readily recognized by its combination of large skull—which nearly equals that of *S. boeyei*—with small teeth, these being only about as in *S. pratensis*.

7. *Epimys* (multimammate).

♂. 15, 18, 20, 37, 38, 44, 50, 65; ♀. 29, 30, 43, 51, 64.

8. *Epimys daltoni*, Thos.

♂. 71, 72. Kabwir, 2700'.

9. *Arvicanthis mordax*, Thos.

♂. 36 (young); ♀. 45.

Not so rufous posteriorly as the type.

10. *Arvicanthis striatus venustus*, Thos.

♂. 14, 42 (young), 86.

The size-variation in this animal is considerable, and one specimen—no. 40—alike in other respects, is so much smaller that I do not venture definitely to include it with the rest until further specimens show if intergradation is complete.

11. *Arvicanthis barbarus nigeriæ*, subsp. n.

♂. 16 (young), 17 (young), 25; ♀. 52, 53, 88.

Pattern and general colour-tone as in Moroccan *A. barbarus*, but size scarcely greater than in *A. dunni*. Light lines buffy, not white as in *A. oweni*.

Skull intermediate in size between those of *A. barbarus* and *dunni*.

Dimensions of the type (measured in skin):—

Head and body 108 mm.; tail 114; hind foot 24; ear 14.

Skull: greatest length 29.3; condylo-incisive length 27; zygomatic breadth 13.4; palatal foramina 6.2; upper molar series 5.

*Type.* Old female. B.M. no. 12. 1. 16. 45. Original number 88. Collected 21st October, 1911.

This is a small local race of the Barbary mouse, its colour agreeing more with that of N. African specimens than with either the Gambian *oweni* or the Soudanese *dunni*.

12. *Dasymys* sp.

♂. 32 (young).

13. *Acomys johannis*, sp. n.

♂. 102; ♀. 109. Kabwir, 2700'.

A fairly large species, with bluish back and buffy sides.

Size about as in *A. viator*, geographically the nearest known species. Coat fully spinous, the spines on the back about 10 mm. in length. Colour of dorsal area bluish grey, of sides finely speckled fawn or buffy, which is sharply defined below from the pure white under surface. Crown blue-grey; cheeks like sides, a large whitish spot below the eye and another at the upper base of the ear. Hands and feet white. Tail of normal length, brownish white above, white below.

Skull low, the ridges of medium development. Post-orbital prominences well marked, so that the supraorbital edges are slightly concave outwards. Teeth larger than in *viator*. Bullæ rather small, much smaller than in that species.

Dimensions of the type (measured in the flesh) :—

Head and body 100 mm.; tail 100; hind foot 17; ear 17.

Skull: greatest length 29·5; condylo-incisive length 26·6; zygomatic breadth 14; nasals 11; interorbital breadth 4·5; breadth on parietal ridges 12·5; height of supraorbital edge from alveolus of  $m^1$  6·3; diastema 8; palatal foramina 7; upper molar series 4·8.

*Hab.* Kabwir, 2700'.

*Type.* Adult female. B.M. no. 12. 1. 16. 49. Original number 109. Collected 15th February, 1911.

This is the first *Acomys* to be discovered in any part of W. Africa, the Tripolitan *A. viator* being its nearest neighbour. It may be distinguished from other species by its grey back and buffy sides, in which respects it resembles certain of the Somali species.

#### 14. *Uranomys foxi*, sp. n.

♂. 31. 7th July, 1911. B.M. no. 12. 1. 16. 50. *Type.* A fairly large species; colour pale.

Size nearly equalling that of the Mt. Elgon *U. ruddi*, markedly larger than in the Gambian *U. oweni*. Fur of the same semispinous texture as the other species; hairs of back about 11 mm. in length. General colour of upper surface grizzled drab, darker along the median dorsal area and becoming more fulvous on the rump. Under surface dull whitish, washed with drab, the line of demarcation little marked; hairs of the belly generally whitish to the roots, but those of the median sternal region slaty grey basally, where also in the type they are stained terminally "walnut-brown." Hands and feet whitish, wrists and ankles greyish brown. Tail uniformly finely haired, about as in *U. ruddi*, hairier than in *U. oweni*, brown above, dull whitish below, not sharply defined.

Skull slightly smaller than that of *U. ruddi*, decidedly larger than in *U. oweni*. Brain-case narrower and lower than in *U. ruddi*, the supraorbital ridges more strongly developed. Occipital plane more vertical, not slanted forward as in that animal. Palatal foramina excessively long, reaching past the level of the back of the inner root of  $m^1$ .

Dimensions of the type (measured in the flesh) :—

Head and body 105 mm.; tail 72; hind foot 18; ear 15.

Skull: condylo-basal length 28·1; condylo-incisive length 28·8; zygomatic breadth 14·4; nasals 9·7; interorbital breadth 5·1; breadth across parietal ridges 10·6; palatilar

length 15·3 ; diastema 9 ; palatal foramina 8·6 ; upper molar series 4·5.

*Type* as above.

The discovery of an additional species of this remarkable genus is of much interest. Its members must be excessively rare or difficult to capture, as among nearly three thousand small mammals collected by Mr. Robin Kemp in East Africa and Uganda only one *Uranomys* was obtained, and the Smithsonian East-African Expedition, among a still larger number, also only got one. Two were got by Mr. Fenwick Owen in French Gambia and another by Mr. Russell Roberts in the same country, the present being therefore the sixth example recorded.

15. *Leggada musculoides*, Temm.

♂. 48.

16. *Georychus foxi*, Thos.

♂. 76, 90 ; ♀. 58, 70, 73, 75, 77, 79, 81.

A very uniform series of this well-marked and interesting species.

Every specimen has a well-defined frontal spot, averaging rather less than half an inch in diameter.

Mr. Fox has had several specimens alive in confinement, and has made the remarkable observation that, in addition to its normal diet of grass, root, and bulbs, this mole-rat eats earthworms greedily.

Although not hitherto published, an analogous observation was made by Major Barrett-Hamilton in S. Africa, a specimen of *G. hottentotus* collected by him bearing on the back of its label "Stomach full of ants." A living specimen he had in captivity refused to eat any vegetable food.

Mr. Fox has been unable to find insect remains in the stomachs of such specimens as he has examined.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

November 22nd, 1911.—Prof. W. W. Watts, Sc.D., LL.D., M.Sc., F.R.S., President, in the Chair.

The following communication was read :—

'The Evolution of *Inoceramus* in the Cretaceous Period.' By Henry Woods, M.A., F.G.S., Lecturer in Palæozoology in the University of Cambridge.

The species of *Inoceramus* found in the Gault, the Upper Greensand, and the Chalk are considered to have descended from two



stocks which occur in the Lower Greensand, one being *I. salomoni* d'Orb., the other of the type of *I. neocomiensis* d'Orb.

(1) *I. concentricus* Park. (Lower and Upper Gault) is of the same type as *I. salomoni* (Folkestone Beds and *Mammillatum* Bed), from which it has been derived by the reduction in the length of the hinge-line and in the height of the hinge-area, accompanied by a greater obliquity of the axis of growth.

*I. sulcatus* Park. (Upper Gault) closely resembles *I. concentricus*, except that it possesses strong radial ribs. Between these two species every gradation is seen in the form known as *I. concentricus* var. *subsulcatus* Wiltsh. (Upper Gault), which in its early stage is identical with *I. concentricus*, but at a later stage develops radial folds; the *concentricus* stage may be of long or short duration, and consequently in some cases the folds occur near the margin of the valves only, but in others may reach to near the umbo, while in *I. sulcatus* they reach to the apex of the umbo.

*I. tenuis* Mant. (Red Chalk and Chalk Marl) is allied to *I. concentricus*, from which it has been derived by an increase in the length of the hinge and a decrease in the prominence of the left umbo. *I. etheridgi* Woods (zone of *P. asper* to zone of *H. subglobosus*) is similar to *I. tenuis*, but its left umbo is smaller, the valves less unequal, and the postero-dorsal region is less compressed.

(II) *I. anglicus* Woods (Gault and Upper Greensand) resembles *I. neocomiensis*, but the posterior part of the shell has become more compressed, and the ventral curvature of the ribs has increased. From *I. anglicus* two species appear to have arisen, namely, *I. pictus* and *I. crippsi*.

A. *I. pictus* Sow. (Chalk Marl to *H. subglobosus* zone) approaches the form of *I. anglicus* which has more numerous and more regular ribs; and in it the ribs have become still more numerous and more regular, and the anterior area has become more extensively developed.

*I. lamarecki* Park. (zone of *Rh. cuvieri* to zone of *M. cor-anguinum*) shows a great amount of variation. An early form has nearly equal valves and only slightly-developed concentric folds, and approaches closely *I. pictus*, from which it is believed to have been derived.

*I. involutus* Sow. (zones of *M. cor-testudinarium* and *M. cor-anguinum*) is linked by intermediate forms with the variety of *I. lamarecki* which has a very convex left valve and prominent umbo. In the intermediate forms the left valve loses its folds, and develops a large, spirally-coiled umbo; the right valve becomes less convex and gradually loses its anterior area, but retains the strong concentric folds.

*I. cordiformis* Sow. (zone of *M. cor-testudinarium* to *Uintacrinus* Band) has been derived from a variety of *I. lamarecki* with inflated and nearly equal valves, by the development of one or two radial sulci and a relatively longer hinge.

*I. costellatus* Woods<sup>1</sup> (Chalk Rock) appears to have come from an early form of *I. lamarchi* by the axis of growth becoming more oblique to the hinge and by the development of a more pointed umbo.

*I. subcardissoides* Schlüt., *I. digitatus* Sow., *I. pinniformis* Will., and *I. corrugatus*, Woods,<sup>2</sup> are allied one to the other, and appear to have arisen from the less convex forms of *I. lamarchi* by the development of radial folds such as occur occasionally in *I. lamarchi* and allied species.

*B. I. crippi* Mant. (Upper Greensand to zone of *H. subglobosus*) agrees in many respects with the form of *I. anglicus* which has fewer and less regular ribs, but in this species the hinge has become somewhat shorter, the postero-dorsal part of the shell less compressed, the anterior area smaller, the ribs fewer and more irregular with a less strongly-marked posterior curvature.

In *I. crippi* var. *reachensis* Eth. (Chalk Marl to zone of *H. subglobosus*) the shell has become relatively higher and the posterior curvature of the ribs greater: this variety resembles closely the small forms of *I. labiatus* (Schloth.) (zones of *Rh. cuvieri* and *T. lata*); but in later stages the shell in that species grows extensively in a direction oblique to the hinge, and thus acquires a mytiliform shape. In the zone of *Terebratulina lata* the specimens of *I. labiatus* are usually longer and less high than in the zone of *Rh. cuvieri*, and these pass into *I. labiatus* var. *latus* Sow. (*H.-planus* Zone).

*I. inconstans* Woods<sup>3</sup> (zone of *H. planus* to zone of *B. mucronata*) undoubtedly belongs to the *labiatus* stock, and the nearly flat forms approach closely *I. labiatus* var. *latus*, from which they have probably been derived.

*I. balticus* Böhm (zone of *Marsupites* to zone of *B. mucronata*) possesses many of the characters of *I. inconstans*, from which it has developed by an increase in the length of the hinge.

*I. lingua* Goldf. (zones of *Marsupites* and *A. quadratus*) is similar to the nearly flat forms of *I. inconstans*, but the shell has become higher. *I. lobatus* Goldf. (zones of *Marsupites* and *A. quadratus*) is near to *I. lingua*, but has developed an angular ridge between the umbo and the postero-ventral extremity. *I. cardissoides* Goldf. (zone of *A. quadratus*) and *I. tuberculatus* Woods<sup>4</sup> (zone of *A. quadratus*) are closely related to *I. lobatus*.

*I. undulato-plicatus* Röm. (Upper Chalk) resembles the nearly flat forms of *I. inconstans*, from which it appears to have been derived by the development of diverging radial folds.

<sup>1</sup> Q. J. G. St vol. liii (1897) pl. xxvii, figs. 14-17.

<sup>2</sup> Type, British Museum, L 22528.

<sup>3</sup> G. A. Mantell, 'Foss. S. Downs' 1822, pl. xxvii, fig. 9, & pl. xxviii, fig. 3; and F. Dixon, 'Geology of Sussex' 1850, pl. xxviii, fig. 29.

<sup>4</sup> Type in Dr. A. W. Rowe's collection, from Sowerby (Yorkshire).

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XXVIII.—*The Classification of the Teleostean Fishes of the Order Pediculati.* By C. TATE REGAN, M.A.

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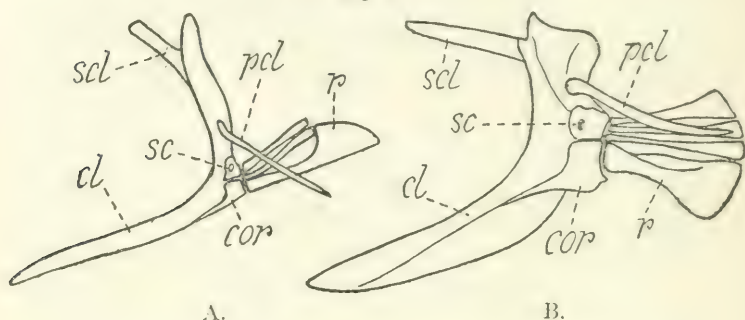
Order PEDICULATI \*.

ACANTHOPTEROUS physoclists with jugular pelvic fins, each of a spine and 5 or fewer soft rays; gill-membranes broadly united to isthmus. Mouth bordered above mainly by the premaxillaries, which are often protractile; maxillaries toothless; no supramaxillaries; suborbitals unossified; hyo-palatine and opercular bones all present, except the mesopterygoid, which is small or absent; lower pharyngeals separate. Parietals, when present, separated by supra-occipital; orbitosphenoid, basisphenoid, and opisthotic absent; first vertebra rigidly attached to skull, the neural arch suturally united to the exoccipitals. Vertebral centra co-ossified with arches; posterior præcaudal vertebræ with downwardly directed parapophyses; hypurals a pair of expanded plates, which may unite to form one only; ribs absent. Post-temporal short, simple, firmly attached or

\* Gill's recent popular illustrated memoirs on the life-histories of the Angler and of the Toad-fishes (Smithsonian Misc. Coll. xlvii. 1905, p. 500, and xlviii. 1907, p. 388) and on 'Angler Fishes; their Kinds and Ways' (Smithsonian Rep. f. 1908, p. 565) contain much of interest concerning the Pediculates.

suturally united to epiote, pterotic, and sometimes parietal and exoccipital; supra-cleithrum more or less elongate; post-cleithrum single; hypercoracoid and hypocoracoid small;

Fig. 1.

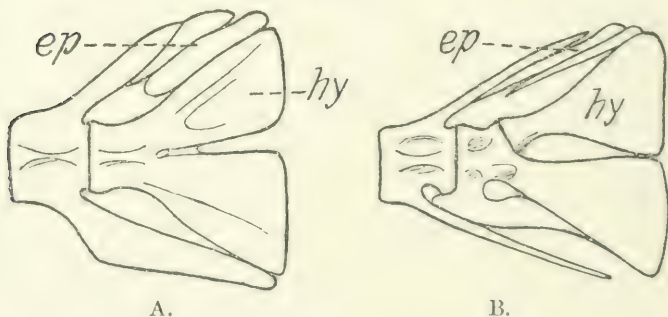


Pectoral arch (inner view) of A. *Antennarius nummifer* and B. *Batrachoides didactylus*.

cl, cleithrum; scl, supra-cleithrum; pcl, post-cleithrum; sc, hypercoracoid; cor, hypocoracoid; r, radial.

no mesocoracoid; pectoral radials elongate, the lowest considerably expanded distally; pelvic bones directly attached to cleithra.

Fig. 2.



Basal bones of caudal fin of A. *Antennarius nummifer* and B. *Batrachoides didactylus*.

ep, epurals (epaxial basalia); hy, hypurals.

The Batrachoidea are here included in the Pediculati rather than in the Percomorphi, for it can hardly be the

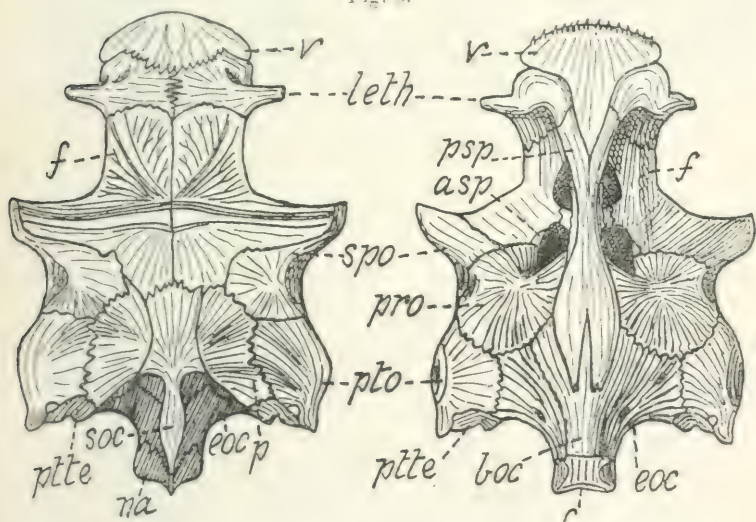


case that the resemblances in osteological characters, especially in the structure of the pectoral arch, are not due to real affinity. In many ways the Batrachoids are more generalized than the typical Pediculates, but in some respects, notably the reduction in number of the pelvic fin-rays and the ankylosis of parietal and epiotic, they are more specialized. The Pediculates might certainly be regarded as highly specialized Percoids, were it not that in the Percomorphi all the principal hypurals are attached to the last vertebra, whereas in the Batrachoids the upper hypural plate is ankylosed to the last half-centrum, and that supporting the lower half of the fin is united to the preceding centrum, much as in the Salmoperceæ; this seems to be a primitive character.

### Suborder 1. BATRACHOIDEA.

Spinous dorsal post-cephalic, of 2 to 4 pungent spines, with fixed basalia; each pelvic fin of a spine and 2 or 3

Fig. 3.



Skull of *Batrachoides didactylus*, from above and from below.

*v*, vomer; *leth*, lateral ethmoid; *f*, frontal; *p*, parietal; *soc*, supra-occipital; *ex*, exoccipital; *boc*, basioccipital; *spo*, sphenotic; *pto*, pterotic; *pro*, pro-otic; *psp*, parasphenoid; *asp*, alisphenoid; *ptte*, post-temporal; *na*, neural arch, and *c*, centrum of first vertebra.

soft rays. Gill-opening in front of base of pectoral; gills 3, none on the fourth branchial arch. Epiotics absent, or anky-

losed with parietals, separated by supraoccipital; no mesethmoid. Epipleurals present, the first running from neural arch of first vertebra to cleithrum. Upper hypural ankylosed to last half-centrum, lower borne by preceding centrum. 4 or 5 pectoral radials.

### Family **Batrachoididæ.**

Body more or less elongate; head depressed; mouth wide, terminal, with conical or cardiform teeth in jaws and on palate. Soft dorsal and anal more or less elongate; pectorals broad-based. Skull depressed, flat above, more or less contracted between and expanded behind the orbits; parasphenoid and frontals united by suture between the orbits. Vertebrae 28-45 (1+9-12+17-34).

Principal genera: *Batrachoides*, *Opsanus*, *Porichthys*, *Thalassophryne*.

The cranial osteology is illustrated by the accompanying figures of the skull of *Batrachoides didactylus*; *Opsanus tau* differs only in minor details, but in *Porichthys porosissimus* the skull is more contracted between the orbits and the lateral ethmoids are separated superiorly by a process of the vomer, which reaches the frontals.

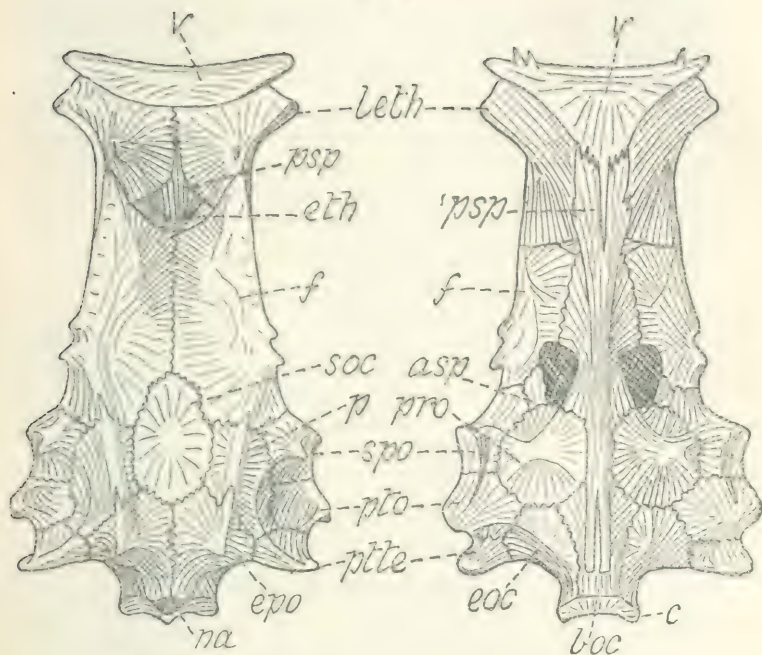
## Suborder 2. LOPHIOIDEA.

Spinous dorsal, when complete, of 6 flexible spines, the first 3 on the head, the first (*illicium*) typically terminating in a flap or bulb; basal bone of illicium movable in a depression on top of head; pelvic fins, when present, each of a spine and 5 soft rays. Gill-opening above, behind, or below, rarely partly in front of base of pectoral; gills 2,  $2\frac{1}{2}$ ,  $\frac{1}{2}+2\frac{1}{2}$ , or 3. Epiotics distinct from parietals, meeting behind supraoccipital; mesethmoid ossified. No epipleurals. Hypural plates ankylosed to last vertebra. 2 or 3 pectoral radials.

### Division 1. LOPHIIFORMES.

Pelvic fins present. Lower pharyngeals dentigerous. Gills 3, complete on first, wanting on fourth branchial arch; pseudobranchiæ. Parasphenoid united by suture to frontals between the orbits; frontals in contact for the greater part of their length; upper surface of skull with a depression in front of the supraoccipital. Precaudal parapophyses directed downwards and obliquely backwards, overlapping and closely attached to each other.

FIG. 4.

Skull of *Lophius piscatorius*, from above and from below.

Lettering as in fig. 3. *eth*, mesethmoid; *epo*, epiotic.

### Family 1. Lophiidae.

Body naked; head large, depressed; mouth wide, protractile, with depressible cardiform teeth in jaws; palate usually toothed. Gill-opening below and behind, or partly in front of base of pectoral. Spinous dorsal typically of 3 cephalic and 3 post-cephalic rays: soft dorsal and anal short or moderate. Vertebrae 19\* to 32 or more. Two long pectoral radials.

The Lophiidae are shore-fishes, or may live on the bottom in deep water. There are 4 well-defined genera, viz.: *Lophius*, Linn., *Lophiomus*, Gill, *Sladenia*, Regan, and *Chirolophius*, Regan. The last is distinguished by the free opercular flap and the long projecting pseudobranchia. In

\* In "*Lophius*" *brachysomus*, Agass., from the Upper Eocene of Monte Bolca, there are about 19 vertebrae, as in *Lophiomus* and *Chirolophius*.

*Lophius* (27 to 32 vertebrae) and *Lophiomus* (19 vertebrae) the gill-openings are below and behind the bases of the pectorals, which can be received within them, whereas in *Sladenia* the pectorals are borne on very long projecting pseudobranchia.

Goode and Bean ('Oceanic Ichthyology,' 1896) have proposed the name *Lophiodes* for *Lophius mutilus*, Alcock, which may be a *Chirolophius*, but differs from the species certainly referred to that genus at least in the absence of a terminal flap to the illicium and the reduction of the post-cephalic portion of the spinous dorsal.

## Division 2. ANTENNARIIFORMES.

Pelvic fins present. Lower pharyngeals dentigerous. Gills complete on second and third arches, absent or reduced to a hemibranch on first and fourth; pseudobranchiae vestigial or absent. Parasphenoid not meeting frontals; depression on upper surface of skull in front of the supra-occipital; frontals united for a short distance posteriorly, separate for the greater part of their length. Præcaudal parapophyses directed vertically downwards, free.

### *Synopsis of the Families.*

- I. Spinous dorsal 3-rayed; mesethmoid lying between, but separate from, orbital portions of frontals.

- Rays of spinous dorsal separate, or connected at the base only; gill-opening below base of pectoral; 3 pectoral radials ..... 1. *Antennariidæ*.  
 Second and third rays of spinous dorsal fully connected; gill-opening behind base of pectoral; 2 pectoral radials ..... 2. *Brachionichthyidæ*.

- II. Spinous dorsal represented by the illicium only.

- Mesethmoid in front of orbital portions of frontals; gill-opening behind pectoral; mouth very oblique; illicium supra-rostral; 3 pectoral radials ..... 3. *Chaunacidæ*.  
 Mesethmoid between orbital portions of frontals; gill-opening above pectoral; mouth horizontal; illicium in a cavity at anterior end of snout; 2 pectoral radials ..... 4. *Onchocephalidæ*.

### Family 1. *Antennariidæ*.

Naked or spinulose, compressed: mouth protractile; teeth in jaws and on palate; gills  $\frac{1}{2} + 2\frac{1}{2}$ ; gill-opening small, immediately below base of pectoral. Spinous dorsal



of 3 cephalic rays, separate or connected at the base; soft dorsal moderate or rather long, anal short or moderate. Mesethmoid narrow, forming a vertical interorbital septum, lying between but well separated from the orbital portions of the frontals; posterior end of mesethmoid attached to anterior end of united portion of frontals (fig. 5, B); opercles narrow. Vertebrae 19; præcaudals not elongate, with separate neural spines and from the fifth with strong parapophyses. Three long pectoral radials.

#### Subfamily 1. *ANTENNARIINÆ* \*.

Form rather deep; mouth moderate, vertical or oblique, with well-developed cardiform teeth; eyes lateral, not projecting. Illicium of moderate length, with terminal flap; soft dorsal of 10 to 15 rays, anal of 6 to 9; pectoral undivided; pelvics free.

*Antennarius*, *Pterophryste*, *Saccarius*, &c., with numerous species from tropical seas.

#### Subfamily 2. *TETRABRACHIINÆ*.

Form elongate; mouth small, transverse, superior; teeth feeble; eyes superior, projecting. Illicium a small simple filament; soft dorsal of 18 rays, anal of 12; pectoral divided into an upper and a lower portion; pelvic broadly connected by membrane to base of pectoral.

A single species, *Tetrabrachium ocellatum*, Günth., from New Guinea.

#### Family 2. *Brachionichthyidæ*.

*Brachionichthys*, with a few species from Southern Australia, differs externally from the *Antennariinæ* in the more elongate form, the second and third rays of the spinous dorsal fully connected by membrane, the longer soft dorsal (15 to 20 rays), and the higher and more posterior gill-openings, behind the pectorals. The skeleton has been figured by Cuvier (*Mém. Mus. Paris*, iii. 1817, pl. 18) and is similar to that of *Antennarius*, except that there are 23 vertebrae and only 2 pectoral radials.

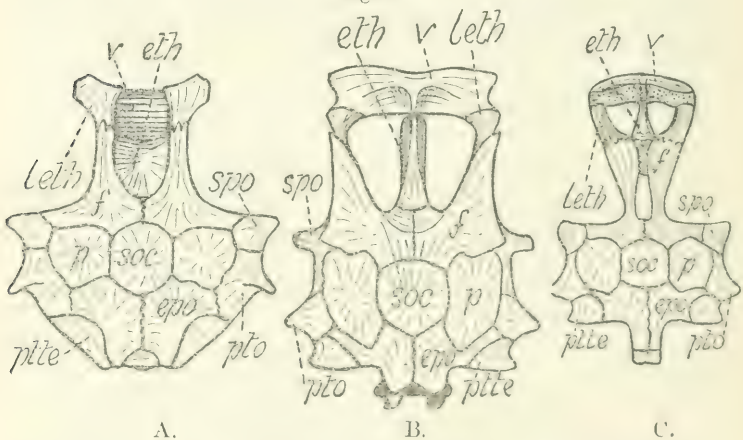
#### Family 3. *Chaunacidæ*.

*Chaunae*, with a few species from rather deep water, differs from the *Antennariidæ* in many important characters;

\* *Histioglyphus bassani*, Zigno, from the Upper Eocene of Monte Bolca, probably belongs to this subfamily (cf. Eastman, *Bull. Mus. Comp. Zool.* xvi. 1904, p. 32, and Gill, 'Science,' (2) xx. p. 845).

the head is as broad as deep; the spinous dorsal is represented only by the illicium, which is short, with a large terminal transverse expansion, the whole folding back in a naked area on the upper surface of the snout, the rest of the fish being spinulose; there is no gill on the first arch; the gill-openings are above and behind the base of the pectorals. Garman's figure (Mem. Mus. Comp. Zool. xxiv. 1899, pl. xvi.) shows that the vertebral column and pectoral arch are Antennariid, but the opercles are notably broader. I have ascertained that the interorbital portions of the frontals are longer and less widely separated than in *Antennarius*, and that the mesethmoid lies in front of instead of between them (fig. 5, C).

Fig. 5.



Skulls of A. *Halieuteca stellata*, B. *Antennarius nummifer*, and C. *Chaunax pictus*, seen from above (somewhat diagrammatic).

Lettering as in preceding figures.

#### Family 4. Onchocephalidæ.

Body spinate; mouth small or moderate, horizontal, terminal or subterminal, protractile downwards; villiform teeth in jaws and sometimes on palate; gills 2 or  $2\frac{1}{2}$ , no gill on the first arch; gill-opening small, above base of pectoral. Spinous dorsal represented by the illicium, which has a very short stalk and broad transverse expansion, the whole contained in a cavity on anterior surface of snout; soft dorsal and anal short, few-rayed, posterior. Mesethmoid ossified as an interorbital septum, but broadening out above

and filling the interspace between the frontals (fig. 5, A); opercles very broad. Vertebrae 19; third to sixth elongate; præcaudals with neural arches laminar, rigidly united, posteriorly (from the seventh) with rather feeble parapophyses. Two long pectoral radials.

Principal genera: *Onchocephalus* (Malthe), *Halieutea*, *Halieutichthys*, *Dibranchus*, *Malthopsis*, *Halimetus*, *Colophrys*.

Garman has figured the skeleton of *Malthopsis* (Mem. Mus. Comp. Zool. xxiv. 1899, pl. xxvi.).

In the typical genera the tail is well-marked off from a strongly depressed circular, ovate, cordate or triangular disc; in *Halieutella* (which may be a young *Halieutichthys*) the disc is subspherical; in *Colophrys* the form is oblong, as broad as deep, the trunk gradually passing into the tail.

Like the Lophiidae, these are shore-fishes or live on the bottom in deep water.

### Division 3. CERATHIFORMES.

Pelvic fins absent. Lower pharyngeals reduced, toothless. Gills complete on second and third arches, absent or reduced to a hemibranch on first and fourth; no pseudobranchiae. Parasphenoid not meeting frontals; a trough or groove on upper surface of skull, its floor wholly or mainly formed by supraoccipital. Præcaudal parapophyses directed vertically downwards, free. Pectoral radials comparatively short.

These are fishes of the open sea, swimming at various depths, uniform in colour, and with the illicium often terminating in a luminous bulb.

#### *Synopsis of the Families.*

I. Illicium present, inserted on upper surface of head; a single nostril on each side.

A. Anal fin short, few-rayed; pectorals small.

1. Soft dorsal short, few-rayed.

Mouth protractile; parietals present; frontals united throughout their length; 3 pectoral radials

1. *Ceratiidae*.

Mouth not protractile; parietals absent; frontals separated by the supraoccipital; 2 pectoral radials

2. *Himantolophidae*.

2. Soft dorsal longer, of 12 to 15 rays; mouth not protractile; parietals present; frontals separated by the supraoccipital; 3 pectoral radials

3. *Melanocetidae*.

B. Anal and soft dorsal moderately long, of 11 to 17 rays; pectorals large

4. *Caulophrynidae*.

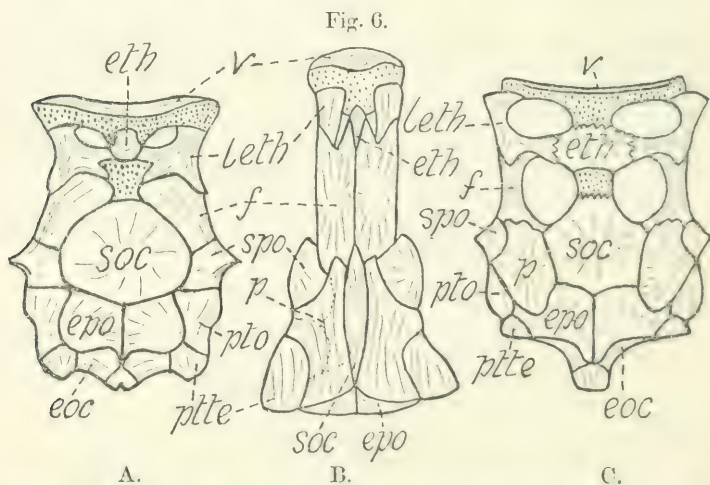
II. Illicium inserted at end of snout

5. *Gigantactinidae*.

III. Illicium absent; two nostrils on each side.

6. *Aceratiidae*.

It will be seen that I am able to give osteological characters for only 3 of the 6 families, but these are exceptionally well defined. Lütken has given valuable descriptions, accompanied by excellent figures, of the osteology of *Ceratias* and *Himantolophus* (Dan. Vidensk. Selsk. Skr. (5) xi. 1878, pp. 307-348, c. figg., and (6) iv. 1887, pp. 323-334, c. pl.). Garman's figure of the skeleton of *Dolopichthys* (Mem. Mus. Comp. Zool. xxiv. pl. xiv.) does not reveal any essential differences from *Himantolophus*. As most of the species of this group in the British Museum collection are represented by unique types, a thorough osteological study was out of the question; on the other hand, the skin of these fishes is so loose, that once an incision has been made (which has generally been done to ascertain the branchial formula) it is a very simple matter to examine the bones of the upper surface of the head. Thus I have been able to ascertain that *Diceratias* shows many important resemblances to *Himantolophus*, but *Melanocetus* differs in the presence of well-developed parietals.



Skulls of A. *Diceratias bispinosus*, B. *Ceratias holbolli*, and C. *Melanocetus johnsonii*, seen from above (somewhat diagrammatic). B is based on Lütken's figure.

Lettering as before.

### Family 1. Ceratiidæ.

Strongly compressed; eyes small; gill-openings below and immediately behind pectorals; gills  $2\frac{1}{2}$ . Mouth pro-



tractile, oblique or subvertical, moderately wide; teeth in jaws acicular, depressible; palate toothless. Spinous dorsal represented by a long slender illicium with terminal bulb inserted on the upper surface of the head, and by a second post-cephalic spine, sometimes replaced by 2 or 3 caruncles; soft dorsal and anal short, posterior, each of 3 or 4 rays; pectorals small.

Præmaxillary pedicels moderately long; maxillaries expanded and truncated distally. Skull long and narrow; frontals meeting throughout their length; supraoccipital narrow, forming the floor of a groove which is bounded laterally by the large parietals (fig. 6, B); epiotics not prominent on upper surface of skull; opercles narrow. Three pectoral radials. Vertebrae 20 (11+9).

Genera: *Ceratias*, *Mancalias*, *Cryptosparas*.

## Family 2. Himantolophidæ.

Mouth not protractile, vertical, oblique or horizontal, wide or moderately wide; teeth in jaws acicular, depressible; vomer sometimes toothed. Gills  $2\frac{1}{2}$  or  $\frac{1}{2} + 2\frac{1}{2}$ , the first arch with or without a hemibranch. Spinous dorsal a supra-rostral illicium with terminal bulb, sometimes followed by a second ray; soft dorsal and anal posterior, short, few-rayed; pectorals small. Præmaxillary pedicels short; maxillaries slender; opercles narrow; skull with a large trough superiorly, the floor formed mainly by the large supra-occipital, which extends forward to the ethmoid region, the margins formed by the frontal ridges, which end posteriorly in a pair of prominent spines borne by the sphenotics (fig. 6, A); frontals completely separated; parietals absent (or ankylosed with the sphenotics). Two pectoral radials. Vertebrae 19 (10+9).

## Synopsis of the Genera.

### I. Spinous dorsal of two rays.

Second ray of spinous dorsal above pectorals .....

*Oneirodes*, Lütken, 1871.

Second ray of spinous dorsal immediately behind the first .....

*Diceratias*, Günth., 1887 (incl. *Paroneirodes*, Alcock, 1890).

### II. Spinous dorsal of a single ray.

A. A long hyoid barbel, bifid distally.

*Linophryne*, Coll., 1886.

## B. No barbel.

1. Skin without scutes ..... *Dolopichthys*, Garm., 1899.
2. Skin with large spinate scutes.

Form compressed ..... *Himantolophus*, Reinh., 1837.  
 Form depressed ..... *Aegeonichthys*, Clarke, 1878\*.

Family 3. *Melanocetidae*.

Mouth not protractile, vertical, wide; teeth in jaws acicular, depressible; vomer sometimes toothed. Gills  $2\frac{1}{2}$ . Spinous dorsal represented by a supra-rostral illicium with terminal bulb; soft dorsal posterior, moderately long, of 12 to 15 rays; anal short, 4-rayed; pectorals small. Præmaxillary pedicels short; maxillaries slender: skull short and broad, with a large trough superiorly, the floor mainly formed by the large supraoccipital, which extends forward to the ethmoid region; frontals completely separated (fig. 6, C); sphenotic not bearing a spine; opercles narrow. Three pectoral radials.

Genera: *Melanocetus*, *Liocetus*.

Family 4. *Caulophrynidae*.

Mouth not protractile, wide, moderately oblique: teeth acicular, in jaws and on palate. Gills  $\frac{1}{2} + 2\frac{1}{2}$ . Illicium slender, with terminal bulb, inserted on upper surface of head; soft dorsal and anal rather long, of 11 to 16 rays, which are considerably produced; pectorals large and broad-based.

This family includes a single genus, *Caulophryne*, with 2 species, *C. jordani*, Goode & Bean, and *C. pelagicus*, Brauer. Probably the opercles are broader and the pectoral radials longer than in other Ceratiiformes.

Family 5. *Gigantactinidae*.

*Gigantactis vanhoeffeni*, Brauer, 1902, differs from the Ceratiidae and Himantolophidae in the insertion of the illicium at the extremity of the snout.

Family 6. *Aceratiidae*.

Mouth terminal, horizontal; 3 rostral denticles (? præmaxillary teeth) above middle of upper jaw; eyes directed forward; 2 nostrils on each side. Illicium absent; soft dorsal and anal very small, 2- or 3-rayed.

\* This genus may not be distinct from *Himantolophus*, as a fish said to be specifically identical with *H. reinhardtii* has recently been described and figured as broader than deep (Williamson, Rep. Fishery Board for Scotland, 1909 (1911), pt. 3, p. 51).

The 3 species described by Dr. Brauer ('Valdivia' Tiefseefische, p. 323, 1906) may be referred to 2 genera: *Aceratius* (*macrorhinus*, *indicus*), with fixed teeth and with a large nasal papilla bearing a small anterior and large posterior nostril; and *Huplophryne*, gen. nov. (*mollis*), with depressible teeth and without nasal papilla.

XXIX.—*New Species of Heterocera from Costa Rica.*—XIV.  
By W. SCHAUS, F.Z.S.

Pyralidæ.

Subfamily PYRAUSTINÆ.

*Neurophyseta turrialbalis*, sp. n.

♀. Palpi and head white. Collar and thorax white, shaded with dark yellow. Abdomen: basal segment whitish, with round, subdorsal, fuscous-brown spots; other segments orange, with paler transverse shades and a dark segmental line on third segment. Fore wings deep orange; a basal spot and origin of lines on costa fuscous; a darker subbasal shade, marked by fuscous-brown spots in cell and below cell, and followed by a yellowish-white shade; antemedial and medial orange-brown lines, oblique on costa, angled on subcostal, the former straight, the latter inbent below vein 2, straight below submedian, the space between the lines whitish above and below submedian; an inbent crescent on discocellular, whitish, faintly edged with dark irrorations; postmedial remote, fine, dark, geminate, divided by a whitish line, outcurved from costa, obsolescent below 4, and preceded by a small whitish shade between 5 and 7; a marginal black streak from apex to vein 3. Hind wings white; an antemedial and a postmedial orange line; the termen shaded with orange, suffusing with an indistinct subterminal orange line.

Expanse 17 mm.

*Hab.* Turrialba, 5000 feet.

*Scybalista sanctalis*, sp. n.

♀. Palpi white, laterally shaded with grey. Body above dark grey; white segmental lines on abdomen; underneath whitish. Fore wings brownish grey; base slightly darker,

limited by a wavy line, dark to submedian, white and outbent on inner margin; antemedial line white, incurved between veins, inbent on inner margin; medial space shaded with whitish beyond cell, dark brownish grey below cell to inner margin; postmedial finely lunular, dark brownish grey, outwardly edged with white, straight on costa, outcurved from 7-2, twice curved below it; apical area dark shaded; a whitish marginal shade, oblique from postmedial at vein 4 to termen near tornus. Hind wings semihyaline bronze-white; a terminal fuscous line.

Expanse 19 mm.

*Hab.* Juan Vinas.

*Lipocosmia plagalis*, sp. n.

♀. Palpi white, the joints tipped with pale fawn. Head, collar, and thorax pale fawn, shaded with white; a reddish-brown streak behind vertex. Abdomen: first segment white, with subdorsal dark brown spots; second segment yellowish buff, with smaller dark subdorsal spots; third segment dark brown, other segments dark grey, all with segmental white lines. Body underneath white. Fore wings pale bistre; base white, crossed by a fine outangled bistre line, irrorated with dark brown scales on inner margin; a fine medial bistre line, angled on costa, irrorated with dark brown from subcostal to inner margin; the space below cell from medial to outer lines dark brown, slightly paler on inner margin; end of cell and space beyond to outer line semihyaline whitish buff, with a few dark scales anteriorly about discocellular; outer line fine, black-brown from vein 8, deeply outcurved and suffusing with dark medial space at vein 3; a terminal white shade above vein 6; a subterminal white line from vein 4 to tornus; cilia silvery. Hind wings: discal space to outer line semihyaline buff-white; tufts below cell brown, tipped with black; outer line fine, black-brown, outcurved and inangled at vein 2; marginal space pale bistre, the termen whitish; a terminal interrupted fine dark line, expanding into a small spot below vein 2.

Expanse 16 mm.

*Hab.* Juan Vinas.

Close to *L. ausonialis*, Dr.; distinguished by the dark medial space below cell.

*Entephria leucinodialis*, sp. n.

♂. Body white. Wings iridescent white, semihyaline. Fore wings: costal margin more thickly scaled: a brownish



streak on costa towards base and two short streaks in cell below it; a white line on discocellular, edged with pale brown; outer line fuscous, broad, and slightly oblique inwardly from costa to vein 4, finer and outcurved between 4 and 2, then slightly inbent to inner margin; the marginal space shaded with light brown, except on costa at apex. Hind wings: a brownish shade on discocellular, followed by some dark points; a subterminal fuscous line, more heavily marked on costa and inner margin, otherwise indistinct and outcurved between 4 and 2; termen more heavily scaled, silvery white.

Expanse 21 mm.

*Hab.* Poas.

*Desmia cristinæ*, sp. n.

♂. Antennæ ciliated. Palpi black-brown, fringed below with silvery white. Head black. Collar fuscous, shaded with copper-colour. Thorax above and abdomen bright copper-colour; thorax below and terminal segments of abdomen black-brown; throat and fore femora silvery white. Wings dark bronze. Fore wings: costa tinged with violaceous; a copper-coloured patch at base, not extending on costal margin; a medial semihyaline white fascia from subcostal to near submedian; a similar narrower streak from vein 8 to vein 3. Hind wings: a medial narrow fascia, narrowing and terminating before inner margin; cilia fuscous, with a fine greyish line at base and tipped with white.

Expanse 21 mm.

*Hab.* Juan Vinas.

Named after Mrs. M. C. Keith.

*Desmia grandisalis*, sp. n.

♀. Palpi, head, and thorax fuscous; throat silvery white. Abdomen fuscous grey above, white underneath. Wings black-brown, markings opalescent white. Fore wings: a broad outbent fascia near middle from subcostal to submedian fold; a large oblique spot beyond cell from vein 8 to near vein 3, its outer edge straight, its inner edge rounded; cilia tipped with white near tornus. Hind wings: a large discal patch not reaching base, costa, or inner margin, the upper edge interrupted by a small black spot towards base, the outer edge straight to vein 5, then angled and straight towards inner margin; cilia tipped with white.

Expanse 36 mm.

*Hab.* Cachi.

*Desmia flavalis*, sp. n.

♂. Palpi yellow, laterally shaded with fuscous grey. Head and body deep yellow; a transverse white line on last segment anteriorly; anal tufts brown. Wings yellow. Fore wings: a fuscous basal line across costa and cell; an antemedial dark line, somewhat wavy and thickest just below median; a large spot at end of cell outlined in fuscous, extending above subcostal; the outer margin broadly purplish brown, its inner edge darkest, nearly straight from costa to vein 2, then inbent and straight to inner margin. Hind wings: a dark discal spot; a fine, irregular, dark postmedial line; the outer margin purplish brown, wide at apex, narrowing to a point at anal angle.

Expanse 32 mm.

*Hab.* Sixola, Tuis, Juan Vinas.

Allied to *D. chryseis*, Hmps.

*Syngamia nebulosalis*, sp. n.

♀. Palpi dark brown, fringed with white at base. Head and thorax greyish brown. Abdomen whitish buff, irrorated with brown and with white segmental lines. Wings whitish, the lines fuscous brown. Fore wings thinly clouded with brown; the base shaded with brown; a slightly curved antemedial line outwardly shaded with brown; a line on discocellular; a medial line from vein 2 to inner margin; postmedial slightly incurved from costa to vein 6, and from 6 to 2, where it is slightly upbent towards discocellular; outer margin broadly fuscous brown, expanding below vein 2 to inner margin; cilia whitish below apex and above tornus, with an interrupted basal brown line. Hind wings: an antemedial shade; a spot at end of cell and medial line from below cell to inner margin; a postmedial line, expanding from vein 2 to anal angle; a subterminal broken line from a large apical space to postmedial at vein 2; a terminal line not reaching anal angle.

Expanse 21 mm.

*Hab.* Juan Vinas.

*Trithyris pretiosalis*, sp. n.

♀. Palpi dark brown. Head whitish, frons partly divided by a brown line; brown tips to scales on vertex. Collar grey-brown, with outer oblique whitish lines. Thorax white, shaded with fuscous brown behind. Abdomen: first two segments white, with lateral black spots; third segment

fuscous, fourth and fifth light reddish brown, all with segmental white lines; terminal segments whitish. Wings mostly opalescent white, thinly scaled. Fore wings: basal area to antemedial brown, except a narrow white basal space crossed by a fine dentate black line; antemedial fuscous, outwardly oblique from costa; a small black spot in cell; a reddish-brown streak on discocellular, irrorated with yellowish scales and edged in cell with a fuscous line; from just beyond middle of inner margin a sinuous fuscous line extends to near discocellular, where it is curved and downbent to submedian; inner margin from just beyond origin of this line reddish brown, irrorated with black; a broad postmedial area broadly bright reddish brown, not extending above vein 8, followed by a fine, black, wavyly dentate line from costa, slightly incurved from veins 8 to 5, then outcurved and not reaching vein 2; a large terminal fuscous-brown spot from vein 5 to apex. Hind wings: base fuscous brown, and a similar streak across cell; a postmedial fuscous streak from vein 2 to inner margin; a large apical fuscous-brown spot preceded by a sinuous wavy line, becoming terminal at vein 2; termen narrowly silvery white; cilia of both wings white, spotted with fuscous at apices.

Expanse 33 mm.

The male differs in having the anal angle of hind wings more produced and shaded with fuscous.

Expanse 30 mm.

*Hab.* Sixola.

Allied to *T. apicolor*, Dr., which also occurs in Costa Rica, is smaller and has the hind wings differently marked.

*Bocchoris obliqualis*, sp. n.

♀. Palpi dark brown, faintly fringed with buff. Head brownish grey. Body white; reddish-yellow lines on collar, patagia, and abdomen above; fuscous segmental lines on last three segments. Wings yellowish white, lines brown shaded with deep yellow; termen narrowly dark brown. Fore wings: costa deep yellow, with fine annular fuscous lines and a fuscous streak along subcostal; a subapical fuscous oblique shade; basal line straight; subbasal curved; antemedial straight, followed by a yellow spot in cell, outwardly limited by a fuscous line; a deep yellow line on discocellular edged on either side by a fuscous line, meeting behind and then slightly inbent to inner margin; postmedial fine, wavy, and irregular, inbent from vein 3 to inner margin; a subterminal dentate punctiform line from subapical shade to vein 2,

where it suffuses with a brown shade to tornus. Hind wings: a spot in cell and one on inner margin, antemedial; a medial dark line downbent on inner margin; a postmedial line, interrupted by an annular spot and downbent to tornus; a subterminal line from costa to termen at vein 2.

Expanse 16 mm.

*Hab.* Juan Vinas, Guapiles.

Allied to *B. adalis*, Wlk.

*Bocchoris placitalis*, sp. n.

♀. Palpi reddish brown, fringed with white. Head light reddish brown; a white patch on frons and a white spot between antennæ. Collar reddish brown in front, silvery white behind. Thorax reddish brown and white. Abdomen white, reddish-brown segmental lines and an angled line on each segment. Wings white, faintly silvery, lines dark brown edged with yellow. Fore wings: a broad fascia from costa at one-fifth from base to inner margin before tornus, below it, inbent basal, antemedial, and medial lines, the last from submedian; a heavier medial line straight to inner margin; above fascia a medial spot in cell containing a light brown shade; the costa medially light yellow-brown; a nearly straight line across discocellular to fascia at submedian, followed by a fine line incurved towards cell, outbent to vein 5, then wavily downbent to 2, curved and upbent to costa, suffusing with discocellular line between 5 and 7, and connected with it by streaks on 2 and 3; the postmedial space enclosed by the curved line, crossed by a dark line on vein 4, below vein 5, and an oblique line above 5; an incurved subterminal line from apex to termen at vein 4 and a wavily incurved line from 4 to fascia before tornus; a terminal line; cilia brown tipped with buff, and some fuscous spots. Hind wings: inner margin with a short streak at base, and short medial and postmedial lines; from base below cell and vein 2 a broad clear white space to termen; a medial line across cell; a line across end of cell, angled and downbent, crossed by a short line, angled again at vein 2, and outbent to irregular marginal brown space, which contains two large round white spots, the spot towards vein 2 not completely edged with brown.

Expanse 20 mm.

*Hab.* Juan Vinas.



*Pilocrocis apellalis*, sp. n.

♂. Palpi fuscous grey. Head brown, with white lines near eyes. Collar, thorax in front, and patagia orange; thorax behind fuscous, with a medial orange line. Abdomen black above, underneath white, with last two segments and anal hairs orange. Wings: the veins broadly purple-black; the interspaces bluish grey, opalescent; cilia black.

Expanse 40 mm.

*Hab.* Avangarez.

*Pilocrocis mapetalis*, sp. n.

♂. Palpi brown above, buff below. Head, body, and wings orange. Fore wings: outer margins with veins broadly black, interspaces whitish, widest on costa, narrowest at vein 3. Hind wings: outer margin similar, the interspaces only whitish on termen; the streaks shorter towards anal angle.

Expanse 35 mm.

*Hab.* Tuis, Sixola.

*Pilocrocis modestalis*, sp. n.

♂. Palpi fuscous grey, each joint shaded with buff. Body fuscous brown above, white underneath. Wings silky brown, the lines fuscous. Fore wings: costa shaded with fuscous grey; antemedial line from subcostal somewhat outbent; a black point in cell and small spot on discocellular; postmedial straight from costa to below vein 3, inbent to below discocellular at vein 2, and straight to inner margin. Hind wings: a discal streak, postmedially inbent below vein 3. Underneath paler, shaded with white at base; markings similar, but more distinct.

Expanse 29 mm.

*Hab.* Sixola.

*Pilocrocis musalis*, sp. n.

♂. Palpi fuscous brown, white at base; a lateral buff spot on second joint. Body fuscous brown above, underneath buff-white; brown spots on fore tarsi. Fore wings brown, tinged with purplish; costal margin fuscous; four semi-hyaline whitish spots beyond cell from veins 3-7, and a small spot in cell, all rather indistinct. Hind wings silky

brown, thinly scaled near cell, between veins 2 and 4, and above 5.

Expanse 30 mm.

*Hab.* Sixola, Banana River.

*Pilocrocis sixolalis*, sp. n.

♂. Body and wings dull greyish brown; anal hairs whitish buff; wings slightly iridescent, the termen broadly dark brown except at apex of fore wing. Fore wings: an antemedial fuscous point in cell and dentate dark line from median to inner margin; an oblique black spot at end of cell; a smaller spot below vein 2; a faint streak on fold and small spot on inner margin; an outer row of dark points between veins from 8-2. Hind wings: a dark shade on upper part of discocellular; a faint outer line of spots, inset below vein 2.

Expanse 34 mm.

*Hab.* Juan Vinas, Sixola.

Near *P. liberalis*, Gn.

*Pilocrocis tortuosalis*, sp. n.

♂. Body buff-brown; abdomen dorsally irrorated with fuscous grey. Wings whitish buff, the outer margins broadly and lines dark brown. Fore wings: a punctiform basal line; antemedial outwardly oblique from costa, straighter below cell, followed by a small spot in cell; a large quadrate spot at end of cell, divided by a pale line on discocellular; postmedial fuscous brown, finely lunular, slightly outbent from costa to submedian fold, upbent to cell, curved inwardly and outbent, forming a horseshoe, straight from submedian to inner margin; from vein 4 to fold the postmedial suffuses with the brown terminal space; an interrupted terminal whitish-buff line. Hind wings: a fuscous shade at end of cell, crossed by a medial fuscous line; the postmedial straight from costa, outset and finely lunular from veins 5-2; the marginal brown space narrowing towards anal angle.

Expanse 34 mm.

*Hab.* Juan Vinas, Esperanza.

*Ulopeza syleptalis*, sp. n.

♀. Palpi brownish, fringed with white at base. Head white; collar white, shaded in front with orange. Thorax white; patagia edged with orange. Abdomen dorsally

orange-brown on basal half, greyish brown terminally, with white segmental lines, broadest at base. Fore wings white; below vein 5 from cell to termen dark lilacine brown, the termen above 5 only narrowly so; veins on white portion orange, also an oblique line at base from cell to antemedial on inner margin; transverse lines dark lilacine brown; a lilacine brown streak above subcostal to beyond cell, extreme costa lighter brown; a white streak postmedially; a sub-basal line to submedian; an antemedial line oblique across cell, then straight to inner margin; an oblique medial spot in cell and a medial streak on submedian fold; a spot at end of cell, bifurcating from vein 6 to subcostal; a subterminal irregular line from vein 5 to costa. Hind wings thinly scaled, whitish, the outer margin shaded with fuscous.

Expanse 26 mm.

*Hab.* Juan Vinas, Tuis.

*Acridura caerulealis*, sp. n.

♂. Palpi white on basal half, fuscous terminally. Body above black shot with dark blue; underneath silvery white; legs streaked with fuscous. Fore wings dark blue on basal half and along costa, otherwise dark purplish; cilia dark brown, tipped with white. Hind wings dark violaceous blue; inner margin broadly dark brown. Underneath dark silky brown; hind wings with tuft of scales on vein 2 at termen.

Expanse 25 mm.

*Hab.* Juan Vinas.

*Acridura pulchralis*, sp. n.

♂. Antennae black, with long tufts of hairs along basal third. Palpi black. Head and collar black, with metallic gloss. Thorax black; a central silvery-grey shade; below dark brown, a crimson lateral spot near head. Abdomen above deep yellow, shaded with crimson on basal half, terminally silky black; anal hairs whitish buff; underneath crimson, the last two segments black. Fore wings violaceous black; termen bronze-brown; inner margin coal-black; cilia black or grey according to light. Hind wings semihyaline through and below cell; the margins broadly dark violaceous brown.

Expanse 25 mm.

*Hab.* Juan Vinas.

*Phryganodes albicillialis*, sp. n.

♂. Palpi, head, neck, pectus, legs, abdomen below, and terminal segments above orange; a fuscous ring at base of fore tarsi. Body otherwise and wings fuscous tinged with grey; cilia white. Fore wings: the basal half shot with dull blue.

Expanse 48 mm.

*Hab.* Tuis, Juan Vinas.

*Phryganodes argentigularis*, sp. n.

♂. Palpi fawn-colour, the base and throat silvery white. Body fawn-colour, tinged with grey on thorax and base of abdomen; anal tufts silvery white, shaded dorsally with brown; underneath white. Fore and mid femora shaded with brown-grey; tarsi, mid and hind tibiae silvery white; fore tibia broadly ringed with fuscous; hind tibia with long black tufts. Wings grey-brown; cilia with a buff line at base. Fore wings: traces of an outbent antemedial line; a black point in cell; a small black spot on discocellular; outer line fine, almost punctiform, outcurved, and with a large black spot on submedian fold. Hind wings: a small black discal spot; postmedian line curved, inbent at vein 2. Wings below rather greyer, the markings as on upper side, but rather finer.

Expanse 32 mm.

*Hab.* Esperanza, Sixola.

*Phryganodes anxiferalis*, sp. n.

♂. Palpi dull grey-brown, fringed with buff at base. Body ochreous brown; fine white segmental lines on last segments; anal tufts black, with a central buff line. Legs buff; a fuscous ring on fore tibia. Wings ochreous brown, the outer margin broadly suffused with fuscous except at apex of fore wings; lines black. Fore wings: an antemedial curved line; a point in cell and a larger but small black spot on discocellular; postmedial remote, finely lunular, and nearly straight to below vein 3, inbent towards cell above 2 and wavy to inner margin in a line with discocellular. Hind wings: a discal streak; postmedial line outcurved beyond cell; cilia whitish buff. Wings below paler, with only a faint trace of postmedial line.

Expanse 32 mm.

*Hab.* Sixola.



*Phryganodes elemental*is, sp. n.

♂. Palpi fuscous, fringed on basal half with whitish. Body fuscous brown above, whitish buff underneath. Thorax below with large fan-shaped tufts of silvery-grey scales. Wings very dark silky brown. Fore wings: outer margin oblique; costa fuscous brown; a fuscous shade on discocellular; very faint traces of a broad antemedial and postmedial darker shade; cilia fuscous grey. Hind wings triangular, slightly produced at anal angle, the apex extending beyond terminus of fore wing; cilia tipped with whitish grey on anal half.

Expanse 23 mm.

Hab. Guapiles.

*Phryganodes evanidal*is, sp. n.

♂. Palpi, head, and collar yellow. Thorax and abdomen greyish; a faint dark dorsal line. Wings silky grey, the veins finely brown.

Expanse 40 mm.

Hab. Tuis, Sixola.

Near *P. eucharis*alis, Wlk.

*Phryganodes gazal*is, sp. n.

♂. Palpi orange, shaded with fuscous above. Head and thorax fuscous brown. Abdomen orange; two basal segments dorsally fuscous shaded. Thorax below and legs orange. Wings fuscous brown, the lines black. Fore wings: antemedial line slightly outcurved; postmedial slightly inbent; medial space paler in cell, the costal margin above it pale buff; a fine dark streak on discocellular; cilia white below vein 3, black above it. Hind wings: postmedial line very indistinct; cilia white except at anal angle and on inner margin, where it is black.

Expanse 34 mm.

Hab. Juan Vinas, Tuis.

*Phryganodes lati*apicalis, sp. n.

♂. Palpi fuscous brown. Head fuscous grey; vertex silvery white. Body above blue-black, underneath white. Legs outwardly fuscous grey. Fore wings: outer margin rounded, giving a broad appearance to apical area, black, somewhat hyaline in cell, beyond, below it, and between veins 2 and 3; the base and costa tinged with dark green,

the inner margin with dark blue, the outer third with violaceous. Hind wings semihyaline, violaceous fuscous; veins black; outer margin more heavily scaled.

♀. Vertex silvery grey. Wings more uniformly tinged with violaceous, with traces of green and blue at base only.

Expanse, ♂ 38 mm., ♀ 36 mm.

*Hab.* Juan Vinas.

*Phryganodes obliquialis*, sp. n.

♂. Palpi buff-brown. Head and thorax white, shaded with grey. Abdomen white; a broad, dorsal, fuscous-grey line. Wings white. Fore wings: the costal margin greyish brown; a dark streak on discocellular; a broad indistinct fuscous shade below vein 2 from cell to tornus; a terminal fuscous streak at apex below vein 8.

Expanse 25 mm.

*Hab.* Sixola.

*Phryganodes patricialis*, sp. n.

♂. Palpi dull greyish brown, fringed with white at base; throat silvery white. Head and collar buff; a brownish spot on frons and medial shade on collar. Thorax brownish; a medial dark line; patagia yellow. Abdomen above yellowish buff; a broad, dorsal, fuscous-grey line. Fore wings thinly scaled, pale yellow; costa shaded with bistre, darkest at base; a fuscous basal spot on costa and subbasal spot in cell; an antemedial, wavy, oblique, fuscous line, followed by a small annular spot in cell; the submedian brownish and a short line medially below it to antemedial; two dark lines at end of cell, coalescing at vein 2 and connected with postmedial by a single line; the postmedial remote on costa, inwardly oblique to vein 5, slightly outcurved and lunular to 2, which it follows to below end of cell, and is then wavy to inner margin; terminal space from postmedial more heavily scaled, purplish brown, enclosing a small yellow spot close to postmedial below vein 2 and one on inner margin. Hind wings semihyaline pale yellow, shaded with brown at apex; a postmedial dark lunular line from costa to vein 2, where it is inset and downwardly oblique.

Expanse 34 mm.

*Hab.* Sixola, Banana River.

*Phryganodes rufalis*, sp. n.

♂. Palpi fuscous brown, shaded with dull red laterally. Head, collar, and thorax dull red; a small white tuft behind eyes. Abdomen above slightly bright red. Body below fuscous; tarsi, mid and hind tibiae white. Wings purplish red, with semihyaline white spots, partly edged with black. Fore wings: small antemedial spots in and below cell; a large spot beyond middle of cell and one below it, both irregular, above the latter a small oblique streak between veins 2 and 3; a large postmedial spot from veins 5-7 and minute spots between 3 and 4 and 4 and 5, also one between 7 and 8; cilia fuscous, tipped with white from tornus to below 3 and spotted with white towards apex. Hind wings: a small spot in cell and a medial streak from cell, tapering towards inner margin, which it does not reach; a large spot beyond cell from vein 2 to just above 6; cilia tipped with white beyond anal angle and near apex; the costa fuscous. Wings below fuscous, shaded with dull reddish brown.

Expanse 40 mm.

Hab. Juan Vinas, Sixola, Tuis, Avangarez.

*Phryganodes seminitidalis*, sp. n.

♂. Palpi, head, neck, pectus, legs, and abdomen below deep yellow; mid and hind tarsi fuscous grey. Body and wings fuscous grey. Fore wings tinged with blue along costa and at base; a blue streak in cell and one below it; a large opalescent white spot beyond cell. Hind wings: a large opalescent white spot from base, extending to near outer margin, leaving inner margin broadly fuscous grey.

Expanse, ♂ 37 mm., ♀ 44 mm.

Hab. Guapiles, Tuis, Juan Vinas.

Allied to *P. hypoxantha*, Dogn., which has the white on hind wings extending to inner margin.

*Nacoleia ceruleonigra*, sp. n.

♂. Antennae with ridge of hairs above on basal third. Palpi dark brown, fringed below with white. Body and wings above black, shaded with dark blue; underneath silky slate-black; legs brownish grey; throat white.

Expanse 16 mm.

Hab. Juan Vinas, Carillo.

*Nacoleia esperanzalis*, sp. n.

♀. Body and wings buff-brown; a transverse black line on abdomen terminally; lines fuscous brown. Fore wings: a subbasal line; antemedial slightly outcurved; a small annular spot in cell; an oblique spot on discocellular, containing a buff streak; postmedial finely lunular, dentate, slightly outbent between veins 6 and 3, then inbent to near cell and downbent to inner margin; terminal small spots between the veins; cilia dark-spotted. Hind wings: antemedial line slightly angled at lower angle of cell and on inner margin; postmedial line from costa to vein 2 nearly straight.

Expanse 22 mm.

*Hab.* Esperanza.

*Nacoleia zethealis*, sp. n.

♀. Palpi and frons greyish buff; body white. Wings white, the lines grey-brown. Fore wings: basal third of costa and lines greyish brown; antemedial line slightly curved on costa, then straight to inner margin; a point in cell and streak on discocellular; outer line sinuous, perpendicular, slightly produced from below vein 5 to 2, upbent to below discocellular, then downbent to inner margin; termen fuscous from above tornus, expanding somewhat to vein 8. Hind wings: antemedial line of fore wing continued straight across hind wing and angled above anal angle; postmedial line straight from costa to vein 3, where it is indistinctly upbent, suffusing with antemedial line; termen narrowly shaded with fuscous.

Expanse 27 mm.

*Hab.* Carillo.

*Sylepta dialis*, sp. n.

♂. Palpi fuscous brown. Head yellowish buff. Collar, thorax, and abdomen deep yellow. Wings deep yellow, the outer margins broadly brown, on which the veins are paler; a terminal fuscous line, interrupted by veins and outwardly finely edged with yellow; cilia fuscous, tipped with white. Fore wings: an irregular dark basal line; an antemedial fuscous line, obliquely curved to submedian, somewhat incurved below it; a black spot at end of cell; postmedial rather broad, fuscous, somewhat outcurved from veins 7-2, its outer edge faintly lunular, inwardly oblique from 2 to inner margin and from costa to vein 7. Hind wings: the postmedial slightly



sinuous. On both wings the postmedial separates the yellow from the brown terminal space.

Expanse 34 mm.

*Hab.* Sixola.

*Sylepta excelsalis*, sp. n.

♂. Palpi white, shaded below with greyish brown. Head and thorax white; some pale brownish shadings on frons and collar and similar irrorations on thorax. Abdomen on basal segments dorsally brown, with subdorsal white lines, interrupted by segmental white lines; terminal segments white. Body below white, the legs partly and faintly shaded with greyish brown. Wings greyish brown, shot with lilacine; a whitish subterminal line, interrupted on fore wing by veins; a terminal dark line, interrupted by white spots, confluent on hind wings. Fore wings: the base broadly white, shaded with yellow, and crossed by a subbasal greyish shade, widest on inner margin; a similar basal spot followed by a white point on median; costa greyish; a small semihyaline space at end and beyond cell, interrupted by small discocellular spot, containing a hyaline point. Hind wings: base white, extending below cell and along inner margin. Underside whitish, showing indistinctly the markings of upper surface.

Expanse 25 mm.

*Hab.* Sixola, Juan Vinas, Tuis, Guapiles.

Allied to *S. cerasalis*, Wlk.

*Sylepta falsalis*, sp. n.

♂. Body and wings above buff-grey, somewhat iridescent. Fore wings: basal half in and below cell tinged with bluish lilacine, the postmedial area faintly tinged with purplish; a fuscous spot in cell and streak on discocellular; postmedial fuscous, indistinct, outcurved from veins 8-2, then angled and marked by a fuscous spot on fold. Hind wings: costa shaded with whitish; faint traces of a postmedial line. Wings below whitish; a fuscous shade on discocellular of fore wing.

Expanse 28 mm.

*Hab.* Juan Vinas.

*Lygropia muralis*, sp. n.

♀. Body and wings above silky greyish brown. Body underneath whitish. Fore wings: lines fuscous, rather coarse, the antemedial nearly straight, the postmedial outcurved beyond cell, straight below vein 3; a slightly paler

streak on discocellular, edged with fuscous; terminal fuscous spots, partly geminate. Hind wings: faint traces of a post-medial line; terminal dark spots as on fore wing. Underneath the costa of hind wings whitish; traces of a postmedial line.

Expanse 17 mm.

*Hab.* Avangarez.

*Glyphodes costaricalis*, sp. n.

♂. Palpi dark brown, fringed with white at base. Head and collar dark brown; a whitish line across vertex in front; tegulae tipped with whitish. Thorax brown, crossed by a violaceous fuscous shade. Abdomen whitish, thickly irrorated with brown; lateral segmental black lines; anal hairs mostly fuscous. Fore wings: the costal margin dull brown, otherwise rich dark brown, somewhat thinly scaled from below end of cell to inner margin; a subbasal black spot below cell, followed by an oblique pale shade; a curved black streak on discocellular; two small opalescent white spots subterminally between veins 5 and 7, and an incurved blackish line below them to inner margin; terminal black shades between the veins; cilia mottled grey and fuscous. Hind wings opalescent, lilacine white, faintly shaded with brown; a black point at end of cell; the outer margin broadly, the inner margin narrowly brown; a black terminal line.

Expanse, ♂ 36, ♀ 42 mm.

*Hab.* Juan Vinas, Poas.

*Glyphodes fuligalis*, sp. n.

♂. Palpi fuscous, fringed at base with white. Head orange. Tegulae fuscous brown, with orange spots. Thorax and abdomen fuscous brown above, the anal hairs mostly light brown; underneath white; legs white, streaked with fuscous. Fore wings brown-black; a large oval, postmedial, oblique white spot, thickly irrorated with brown-black. Hind wings black; a large elongated white space from base, extending above, below, and beyond cell; a fine white streak along inner margin. Underneath black, the spots as above but clear white; a white streak below cell on fore wings; a broad white streak along inner margin on hind wings.

Expanse 36 mm.

*Hab.* Juan Vinas.

Allied to *G. auricollis*, Snell.

*Glyphodes nigricilialis*, sp. n.

Palpi fuscous, fringed at base with white. Body fuscous brown above, white underneath. Fore wings dark brown, tinged with purple; an opalescent semihyaline white space from inner margin near base to beyond middle, oblique to beyond cell, narrowing and forming a line only from above vein 5 to near 8, its outer edge finely wavy. Hind wings semihyaline, opalescent white; outer margin broadly dark brown, narrowing to a point at tornus; cilia entirely black.

Expanse 31 mm.

*Hab.* Tuis, Guapiles.

Nearest *G. lucidalis*, Hbn., from which it can be distinguished by its larger size and entirely black cilia.

*Glyphodes novicialis*, sp. n.

♂. Palpi fuscous brown, fringed at base with white. Head, collar, and thorax purplish brown. Abdomen white; last two segments dorsally dark grey; anal tufts laterally pale reddish brown. Fore wings deep silky purple; an opalescent semihyaline white space along inner margin from near base to beyond middle, its anterior edge extending obliquely to beyond cell near vein 5, its outer edge lunular, inbent at vein 2. Hind wings semihyaline opalescent white; the apex broadly purplish, narrowing to a point at vein 3.

Expanse 25 mm.

*Hab.* Guapiles.

*Leucinodes xylopastalis*, sp. n.

Palpi, head, and thorax white, shaded with greyish buff. Abdomen olive-buff, with darker shadings posteriorly on each segment; a transverse white line at base and a geminate dorsal white line on last five segments. Wings semihyaline, except markings, greenish white. Fore wings: costal margin creamy white, shaded with olive-buff at base; inner margin white, irrorated with olive-buff; a fine outcurved antemedial dark line; a cluster of pale scales in middle of cell and a similar cluster below vein 2; a fine fuscous line on discocellular, broadly bordered outwardly with creamy buff; veins beyond cell irrorated with black; an outcurved subterminal black-brown line, obliquely incurved from vein 2, followed by an ochreous-buff shade; termen narrowly white, with some dark brown spots. Hind wings: a fuscous-edged olive-buff line on discocellular;

subterminal line upbent below vein 3 towards discocellular; outer margin as on fore wing.

Expanse 31 mm.

*Hab.* Turrialba, 6000 feet.

*Crocidolomia limatalis*, sp. n.

♂. Palpi dark grey, with two white rings on second joint. Head, collar, and thorax brown; white lateral lines on frons and tegulae; patagia partly white-edged. Abdomen grey-brown. Fore wings silky brown, tinged with dull red; a fine darker antemedial line, somewhat lunular and preceded by a darker shade; a fine darker postmedial line, slightly outcurved below costa and followed by an oblique white line on costa; an interrupted terminal line partly shaded with black, terminating in a small white spot and black point at apex; cilia fuscous or luteous, according to light, more clearly luteous at tornus. Hind wings silky brown, the veins darker; outer half of cilia whitish.

Expanse 31 mm.

*Hab.* Juan Vinas.

Larger than *C. palindialis*, Gn., and of a different colour.

*Sameodes fortunata*, sp. n.

Palpi brown. Head white. Collar pale reddish brown. Thorax and patagia silvery grey. Abdomen above dark brown except basal and last segments, which are buff. Body underneath buff-white. Fore wings whitish; basal third of costa and cell shaded with brown; yellow-buff shades basally below cell; a broad antemedial, irregular, fuscous shade; a dark brown medial line obliquely wavy from costa, outangled on fold, inangled on inner margin, followed in cell by a fuscous shade and yellow-buff spot, outwardly limited by a dark curved line; a dark line from cell along vein 2 for a short distance, then wavy to inner margin; across discocellular a yellow-buff, incurved crescent, finely edged with brown, the points semi-connected by small brown and yellowish spots beyond cell, which form part of a postmedial punctiform line; a broad subapical fuscous-brown shade from costa to marginal line at vein 5, the latter also fuscous brown and not reaching apex, both edged inwardly and along termen with yellow-buff; the marginal line expands at tornus; the veins partly shaded with yellow-buff. Hind wings: the marginal line broader from below costa, upbent along inner margin, expanding medially, and coalescing with



a dark spot below vein 2; a line downbent postmedial line; yellow shadings along marginal line, which is irrorated with silvery-grey scales; a fine terminal dark line and points on both wings; cilia yellow.

Expanse 22 mm.

*Hab.* Juan Vinas.

*Thliptoceras neotropicalis*, sp. n.

Palpi and head grey-brown. Thorax and abdomen above fuscous brown, underneath whitish buff. Fore wings fuscous brown; a slightly outcurved antemedial black line, inwardly heavily edged with yellowish buff; costal margin medially yellowish buff, suffusing with a small pale spot in cell, and a larger spot adjoining postmedial, the latter being fuscous, suffusing with dark portion of wing and indicated by a narrow yellowish-buff shade along its outer edge, and is inbent from veins 5-2, below 2 slightly outbent; cilia fuscous between veins 2 and 4, otherwise yellowish buff with dark points at veins. Hind wings fuscous grey-brown. Underneath dark silky grey, with the lines indicated by fuscous shadings which extend on to hind wings; fore wing with a pale spot in cell and one beyond it; the costa buff at apex.

Expanse 18 mm.

*Hab.* Carillo.

*Acochis curvilinealis*, sp. n.

♂. Palpi coal-black, fringed with white below. Frons dark brown, edged with coal-black, vertex white. Collar opalescent white, with a large medial fuscous-grey spot, also opalescent. Thorax white; a black spot behind; patagia opalescent white. Abdomen white; third and fourth segments dorsally coal-black; transverse black lines on last two segments. Wings semihyaline opalescent white; termen narrowly dull white; cilia yellowish, tipped with white. Fore wings: costal, inner margin, and veins creamy white, except where crossed by black markings; a minute basal spot on costa; a large subbasal spot on costa and one on inner margin; an antemedial line, outwardly expanding below cell; a medial spot in cell; a large oblique spot on discocellular; streaks beyond cell between veins 3 and 4 and 4 and 5, and a large inbent spot from 3 tapering to inner margin; an oblique curved postmedial line from costa to vein 3; a marginal spot from tornus to near vein 3; an elongated spot from above 3 to vein 6, where it is widest; points above 6 and 7. Hind wings: a medial streak across

cell; a small postmedial spot between 5 and 6; a postmedial streak on inner margin; marginal streaks near anal angle and across vein 5.

Expanse 31 mm.

*Hab.* Tuis.

*Azochis graphialis*, sp. n.

♂. Palpi black, fringed with white. Head whitish; collar yellowish bistre, with a large medial fuscous-brown spot. Thorax fuscous brown; patagia whitish, with a small black spot. Abdomen pale bistre, with segmental white lines and dorsal black transverse spots on alternate segments. Fore wings pale bistre, thinly scaled; a subbasal black point in cell; a slightly inbent antemedial black line, faintly edged with reddish; a black point in middle of cell; postmedial line black, faintly inbent, thickening near submedian, with a spot below it; another line starting from same point on costa is outbent to near submedian, and preceded on vein 2 by a black spot, the narrow space between the lines shaded with reddish ochre across discocellular; a third black line from costa just beyond postmedial, outbent to below vein 5, then curved, inbent, finer, and interrupted to previous line above submedian, the two lines enclosing an almost triangular semihyaline whitish space; the termen narrowly white; a black point at apex; a marginal black spot above vein 6 and an oblique larger spot below it extending on cilia; a black point near tornus. Hind wings semihyaline white, the inner and outer margins pale bistre; a black point on discocellular and a larger spot at angle where joined by veins 3 to 5, this last continued as a coarse line to near inner margin above angle; a fine postmedial line from vein 3 to fold, down-curved and bent back to near costa as a subterminal line; termen narrowly white; an interrupted fine black terminal line, thickened from vein 3 to fold.

Expanse 28 mm.

*Hab.* Guapiles, Sitio, Juan Vinas.

*Azochis oncalis*, sp. n.

♂. Palpi coal-black, fringed below with white. Frons coal-black. Vertex white. Tegulae opalescent white, dorsally and outwardly edged with black. Thorax white; a small black spot behind. Abdomen white; a small reddish-brown spot dorsally on first segment and similar subdorsal shades on second segment; segments 3-5 dorsally black, edged in front

and behind with reddish brown; black transverse streaks on last two segments, also edged with reddish brown. Wings opalescent white, semihyaline; termen white; cilia yellowish, tipped with white. Fore wings: veins opaque, white; some pale reddish-brown streaks on costa and along vein 8; spots black, partly edged with pale reddish brown; a basal spot on costa; a subbasal small spot in cell and a large spot on inner margin; an antemedial outbent line, angled and thicker below cell; a medial spot in cell; a larger spot across discocellular from above subcostal; a round postmedial spot from vein 5 to above 6, and a line above it across costa; a large spot from vein 3 to inner margin; marginal streaks between 6 and 8; a large spot from 6, tapering to below 4, and a small spot at tornus. Hind wings: a spot in cell; small postmedial spots beyond cell and on inner margin; subterminal points above and below vein 4; marginal spots from vein 4 to apex.

Expanse, ♂ 32 mm., ♀ 39 mm.

Hab. Juan Vinas, Sitio.

*Rhectosomia compositalis*, sp. n.

♂. Palpi light brown, fringed with white at base. Head and collar pale olive-brown. Patagia whitish, streaked with olive-brown. Abdomen above dark grey on basal half, terminal half olive-brown, dorsally paler. Fore wings: basal third of costa and outer half of inner margin pale buff; costa medially white, also a large postmedial white spot and smaller spot beyond; spaces between spots on costa and cell olive-brown; a longitudinal black streak at end of cell to buff crescent on discocellular, which is followed by a black line, and some mottled dark and white scaling; a basal white streak below cell; base of inner margin pale buff; a broad black antemedial shade from median to inner margin, shaded with lilacine and followed by an inbent olive-brown space, shaded with white just below cell; beyond this the medial shade is darker and tinged with reddish brown between cell and fold; a fuscous streak medially along fold is angled and inbent to inner margin; on outer buff space below cell between veins 2 and 3 a long lilacine streak, its ends slightly downcurved, and edged below with light reddish brown; postmedial space from 3-8 dull olive, becoming darker on termen; some elongated, fine, black, curved lines between veins postmedially, followed by lilacine white streaks terminally, edged with dark brown. Hind wings white; a terminal

brown spot at vein 2 and some brownish clusters from it to anal angle.

Expanse 30 mm.

*Hab.* Poas, Turrialba.

*Pionea contentalis*, sp. n.

♂. Palpi long, light reddish brown, fringed below with white. Body and wings luteous, the latter thinly scaled. Fore wings: a fine, dark, outbent antemedial line, hardly perceptible; a faint point in cell and streak on discocellular; postmedial fine, indistinct, outbent on costa, curved and inbent to below discocellular, then wavy to inner margin, slightly outangled on submedian fold; termen darker shaded. Hind wings: costa whitish; postmedial line very fine, inset at vein 2.

Expanse 14 mm.

*Hab.* Juan Vinas, Sixola.

Very similar to *P. eupalusalis*, Wlk., and is chiefly distinguished from that species by the longer palpi and more acute apex of fore wing.

*Pionea montanalís*, sp. n.

♂. Palpi fuscous brown, fringed with white at base. Frons light brown; vertex whitish. Thorax brown, laterally streaked with white. Abdomen above fuscous brown; subdorsal white streaks at base. Fore wings brown, with darker irrorations; a round whitish dark-edged spot in middle of cell; a curved whitish line on discocellular, more broadly edged with dark brown; a small black postmedial spot on costa. Hind wings white; a terminal brownish line, somewhat interrupted by veins; cilia whitish, with a dark line near base; a minute dark spot on inner margin above anal angle.

Expanse 21 mm.

*Hab.* Poas.

*Pionea poasalis*, sp. n.

♂. Palpi dark grey. Head, collar, and thorax dark grey. Abdomen fuscous above, whitish laterally and underneath, with sublateral black spots. Legs whitish grey, thinly irrorated with black. Fore wings greyish buff, thinly scaled below cell, and with a few scattered black irrorations; a large fuscous shade in middle of cell, extending above subcostal; a similar shade at end of cell, with a white point at lower angle



of discocellular; an indistinct, finely dentate, outer line remote from cell, followed by a vague subterminal darker shade; terminal black points. Hind wings thinly scaled, white; an indistinct fine postmedial line, termen faintly tinged with light brown; some terminal dark points, better defined on underside.

Expanse 25 mm.

*Hab.* Poas.

*Pyrausta entephrialis*, sp. n.

♂. Palpi fuscous brown, fringed below with white. Body silky buff-white; a dorsal brownish line on abdomen. Wings whitish. Fore wings tinged and irrorated with light brown; costa shaded with dark olive-brown; an antemedial brown line, slightly incurved below submedian, and followed in cell by a dark point; a fuscous-brown streak on discocellular; a postmedial brown line, finely dentate, and deeply outcurved to vein 3, then inbent and wavy to inner margin; a terminal dark line interrupted by veins. Hind wings: some indistinct brown irrorations at end of cell; a fine outcurved postmedial brown line; a faint brownish marginal shade on costal half suffusing with terminal line at apex.

Expanse 25 mm.

*Hab.* Juan Vinas.

*Pyrausta tuisalis*, sp. n.

♂. Palpi brown, fringed with silvery white below. Head greyish buff. Collar and thorax buff-yellow, outwardly shaded with brown. Abdomen yellow-brown, with whitish segmental lines. Fore wings buff-yellow, the costa and apical area shaded with brown; a fine brown, outbent, wavy, antemedial line; a dark point in cell; an oblique line on discocellular; postmedial fine, brown, lunular, and deeply outcurved from veins 8-2, then slightly oblique to inner margin, preceded by a fuscous shade between 2 and 5, and some darker shading on inner margin. Hind wings thinly scaled, yellow tinged with brown; a small dark discal spot; a dark, finely dentate, postmedial line.

Expanse 32 mm.

♀. Wings brighter yellow, with the dark shade between veins 2 and 5 more pronounced.

Expanse 32 mm.

*Hab.* Tuis, Esperanza, Juan Vinas.

Comes next to *P. flavidensalis*, Warr.

XXX.—*Seven new African Dormice.*

By GUY DOLLMAN.

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*Graphiurus crassicaudatus dorotheæ*, subsp. n.

A brownish-red-coloured form allied to and rather larger than *Graphiurus crassicaudatus*, Jenk.

Size and general proportions greater than in *crassicaudatus*. General colour of back a rich rusty brown (between snuff-brown no. 4 and raw umber no. 3, 'Répertoire de Couleurs'); flanks a trifle lighter than back, the rusty-brown tint passing fairly abruptly into the grey colour of the ventral surface. Forehead and sides of face paler and greyer than general colour of back. Hairs of face like those of back, all with grey bases and rusty-brown tips. Dark rings around eyes well marked. Backs of hands and feet dirty white tinted with buff. Under surface of body pale slaty grey, washed with pale buffy white. Tail rather darker in colour than body. Unfortunately the tail of the type specimen is broken, while that of the other specimen sent by Mr. Talbot and referable to this new form is of the regenerated kind and therefore useless for comparative purposes. The basal portion of the tail of the type specimen appears to be rather more of the distichous than the bushy kind, and therefore markedly different from the *murinus* group, in which the tail is always bushy. There is not sufficient evidence to show whether the tail is really as distichous as that of *G. hueti*, but the arrangement of the hairs on the basal portion of the tail seems to indicate a much more distichous condition than is found in any of the "*murinus*" group. The closely allied form, *crassicaudatus*, probably has a similar semi- or wholly distichous tail, but here, again, the type and only known specimen possesses a regenerated club-shaped tail.

Skull presenting the same unusual characters as exhibited in *crassicaudatus*. The skulls of these two forms are so unlike all the other small and medium-sized *Graphiurus* that a note as to their chief characters may not be out of place here. Brain-case unusually broad, both in the squamosal and occipital regions; interorbital breadth much greater than in the "*murinus*" group. Nasals narrow and parallel-sided, not expanded anteriorly, a very marked departure from the usual form of *Graphiurus* nasals, which are

considerably broader in front than behind. Palatal region excessively broad. Auditory bullae smaller and flatter than usual. Incisor teeth slanting slightly forward, a most exceptional feature, the incisors in this genus being, as a rule, set in a vertical or slightly recurved position. Molar teeth comparatively large. The skulls of *crassicaudatus* and this new form would appear to have many points in common, the difference in size not being nearly so well marked as in the skin-dimensions. On this account, it seems best to consider the colour and size differences as of subspecific value and to regard this Nigerian dormouse as a geographical race of *crassicaudatus*.

Dimensions of the type (measured in the flesh):—

Head and body 89 mm.; tail 45 \*; hind foot 17; ear 12.

Skull: greatest length 27.5; basilar length 20.8; condylo-basilar length 23.5; condylo-incisive length 25; zygomatic breadth 16; interorbital constriction 5.5; squamosal breadth of brain-case 13; occipital breadth of brain-case 12; length of nasals 9; greatest width of nasals 2.7; palatilar length 10; width of palate (inside *m*<sup>1</sup>) 3.3; width across palate (outside *m*<sup>1</sup>) 6.2; length of palatal foramina 2.7; postpalatal length 11; length of upper tooth-row 4.2.

*Hab.* Oban District, Southern Nigeria.

*Type.* Adult female. B.M. no. 12. 1. 12. 1. Original number 61. Collected and presented to the British Museum by P. A. Talbot, Esq.

This Nigerian dormouse appears closely allied to the Liberian *crassicaudatus*, and, at present, represents the eastern limit of that group. The cranial characters exhibited by these two forms are quite unlike those found in the "*marinus*" group, and the only approach to these conditions is found in the large *Graphiurus hueti*, which agrees with the *crassicaudatus* group as regards the broad cranial and interorbital regions and the narrow parallel-sided nasals. These cranial characters considered together with the question of the distichous tail appear to justify the conclusion that the *crassicaudatus* group are diminutive allies of the large West-African dormice belonging to the *hueti* group.

This handsome new form is named after Mrs. Talbot; it forms a most worthy addition to the long list of new and rare Nigerian mammals collected by Mr. Talbot and presented by him to the National Collection.

\* Broken.

*Graphiurus surdus*, sp. n.

A small-eared species allied to *murinus*.

Size of body a trifle less than in *murinus*; hind foot large; ears remarkably small, about 5 mm. shorter than those of the South-African species. Fur rather short and thick; hairs on back measuring about 7 or 8 mm. in length. General colour of upper surface of body greyish brown. Individual hairs of back slate-grey with light brownish tips. Flanks similar in colour to back. Muzzle and face between eyes paler and yellower than rest of upper surface. Eyes surrounded with dark rings; dark markings on muzzle, in front of eyes, very indistinct. Sides of face, below eyes, white; hairs grey with long white tips. Upper lip covered with short white hairs. Backs of hands and feet yellowish white. Under surface of body greyish white, tinged with buff; hairs of belly with dark grey bases and white tips. Chin and lower lip, as usual in this genus, covered with short white hairs. Tail cylindrical and rather less bushy than in *murinus*; hairs of tip about 22 mm. in length; upper side of tail similar in colour to back, lower surface rather greyer.

Skull markedly different from that of any other known form, the occipital part of the brain-case broad and almost rectangular in shape, giving the skull a very unusual appearance. Nasals broad anteriorly. Auditory bullæ rather flat. Cheek-teeth comparatively small.

Dimensions of the type (measured from spirit-specimen):—

Head and body 87 mm.; tail 67; hind foot 19; ear 9.

Skull: greatest length 28; basal length 23.5; condylo-basal length 25.8; basilar length 21; condylo-basilar length 23.5; condylo-incisive length 25.3; zygomatic breadth 15; interorbital constriction 4.5; squamosal breadth of brain-case 13; occipital breadth 12.4; greatest length of nasals 11.4; greatest breadth across nasals 3.5; least breadth across nasals 1.8; palatal length 11.8; palatilar length 9.5; width of palate (inside *m*<sup>1</sup>) 3.5; width across palate (outside *m*<sup>1</sup>) 5.5; length of palatal foramina 3; postpalatal length 12.3; length of upper tooth-row 3.

*Hab.* Benito River, French Congo.

*Type.* Adult female. B.M. no. O. 2. 5. 55. Collected by Mr. G. L. Bates in July 1899.

The small ears, large hind feet, and unusual shape of the occipital region immediately distinguish this dormouse from all the other allied forms.

Mr. Bates collected four specimens of this interesting



species, all at the type locality, and as the specimens are preserved in spirit, the true colour of *surdus* cannot be described with certainty; it appears to have been very much like that of the South African *murinus*, judging by the similarity between alcoholic specimens of each species.

*Graphiurus spurrelli*, sp. n.

Allied to *G. lorraineus*, Dollm., but paler in colour and with smaller teeth.

Size of body greater than in *lorraineus*; hind foot larger. General colour of back very much paler and less rufous than in *lorraineus*, more like the olive tint of *microtis*, but washed with pale brown (otter-brown no. 3 mixed with chocolate no. 1, 'Répertoire,' represents the general colour of the dorsal surface). Hairs of back with slaty black bases and olive-brown tips. Flanks paler and yellower than back. Muzzle lighter and greyer than rest of dorsal surface. Dark rings around eyes faintly developed; dark markings on sides of muzzle in front of eyes practically absent. Cheeks white, hairs with slate-grey bases and whitish tips. Backs of hands and feet dirty white. Ventral surface of body slate-grey washed with white, less buffy than in *lorraineus*. Tail fairly long, about like that of *microtis saturatus*; in colour pale liver-brown, above and below.

Skull rather larger than that of *lorraineus*, with a narrower interorbital region. Nasals broader anteriorly. Cheek-teeth smaller and narrower.

Dimensions of the type (measured in the flesh):—

Head and body 100 mm.\*; tail 75\*; hind foot 18; ear 14.

Skull: greatest length 27.5; basilar length 20.5; condylo-basilar length 22.5; condylo-incisive length 24; zygomatic breadth 15; interorbital constriction 4.7; squamosal breadth of brain-case 12.3; greatest occipital breadth 11.3; length of nasals 10; greatest anterior width of nasals 4; palatilar length 8.9; breadth of palate (inside *m*<sup>1</sup>) 3.7; width across palate (outside *m*<sup>1</sup>) 5.9; length of palatal foramina 2.9; length of upper cheek-teeth 2.9.

*Hab.* Bibianaha, 60 miles west of Kumasi, Gold Coast Colony.

*Type.* Adult female. B.M. no. 10.4.13.2. Collected by Dr. H. G. F. Spurrell and presented by him to the British Museum.

\* Measured from dry skin.

This species is distinguished from the allied form *Lorainus* by its larger size, paler colour, and smaller teeth. There are in the Museum collection five further specimens referable to *Graphiurus spurrelli*, four collected by Dr. Spurrell at the type locality and one from Sierra Leone.

It is with pleasure that I associate this new species with the name of Dr. Spurrell, to whom Zoology is already indebted for the discovery of many new and interesting West-African Mammalia.

*Graphiurus hædulus*, sp. n.

A rather small yellowish-olive-coloured species, probably allied to *Graphiurus spurrelli*, described above.

Skin-dimensions not markedly different from those of the Gold Coast species. General colour of back bright yellowish olive (olive-brown washed with cinnamon no. 1, 'Répertoire'), like that of *microtis* but purer and yellower in colour. Hairs of back with slaty grey bases, buffy subterminal rings, and brownish tips. Flanks washed with yellowish buff, the buff colour sharply defined against the white of the ventral surface. Muzzle and head similar in colour to back. Dark ocular rings and markings on sides of muzzle rather better defined than in *spurrelli*. Cheeks pure white; hairs with grey bases and white tips. Backs of hands and feet white. Entire underparts dark slate-grey washed over with pure white. Tail like that of *spurrelli* in colour; in general form the tail of this specimen, although apparently of the bushy kind, exhibits a distinct tendency to become distichous.

Skull smaller than that of *spurrelli*, but with larger cheek-teeth.

Dimensions of the type (measured in the flesh) :—

Head and body 88 mm.; tail 70; hind foot 18; ear 12.

Skull: greatest length 24.9; basilar length 19; condylo-basilar length 21.2; zygomatic breadth 14.9; interorbital constriction 4.3; squamosal breadth of brain-case 12; occipital breadth 10; length of nasals 9.5; greatest anterior breadth across nasals 3.1; palatal length 10.1; width of palate (inside  $m^1$ ) 3.4; width across palate (outside  $m^1$ ) 5.7; length of palatal foramina 2.7; postpalatal length 10.4; length of upper tooth-row 3.3.

*Hab.* Assobam, Bumba River, Cameroons. Altitude 2000 feet.

*Type.* Adult male. B.M. no. 9.10.2.21. Original number D. 28. Collected by Mr. G. L. Bates on December 15th, 1908.

The colour of this species is so unlike that of all the other West-African forms that it is readily distinguished from its near allies. In addition to these colour-differences the cranial and dental characters serve to distinguish this Cameroon species from the Gold Coast dormouse, *Graphiurus spurrelli*.

*Graphiurus ansorgei*, sp. n.

Allied to *G. murinus*, Desm., lighter in colour and with no dark markings on sides of muzzle.

Size and general proportions rather less than in *murinus*. Fur quite similar to that of the other medium-sized *Graphiurus*. General colour of upper surface light ashy grey (between ashy grey no. 1 and smoke-grey no. 1, 'Répertoire de Couleurs'). Individual hairs of back dark slaty grey with long light greyish tips; a number of longer hairs, with rather darker tips, evenly scattered over the whole of the dorsal surface. Flanks similar in colour to back, the grey tint gradually fading into the whitish colour of the ventral surface. Face and top of head rather lighter than back. Eyes surrounded with narrow blackish-brown rings. No dark marks on sides of muzzle, in front of eyes, such as occur in *murinus* and the allied forms. Cheeks white; hairs dark slate-coloured with long white tips. Backs of hands and feet white. Under parts of body slate-grey, overlaid with white. Tail similar to that of *murinus*, rather lighter in colour and with the extreme tip whitish, but not to such a marked extent as in the Tanganyika species, *G. microtis*, Noack.

Skull smaller than that of *murinus*, in general dimensions more resembling that of *griselda*, but not having the premaxillæ prolonged back beyond the nasals. Nasals fairly long, intermediate in length between those of *murinus* and *griselda*. Cheek-teeth rather small.

Dimensions of the type (measured in the flesh):—

Head and body 90 mm.; tail 90; hind foot 16; ear 15.

Skull: greatest length 26; basal length 22.6; condylo-basal length 24.7; basilar length 20; condylo-basilar length 22; zygomatic breadth 14.4; interorbital constriction 4; squamosal breadth of cranium 11.6; greatest length of nasals 10; greatest breadth across nasals 3.2; palatal length 10.7; palatilar length 8.1; width of palate (inside *m*<sup>1</sup>) 3; width across palate (outside *m*<sup>1</sup>) 5; length of palatal foramina 3.3; postpalatal length 11.8; length of upper molar series 3.

*Hab.* Tala Kilau, Dongwenna, Mossamedes, South Angola. Altitude 3000 feet.

*Type.* Adult female. B.M. no. 9. 10. 1. 60. Original number 20. Collected by Dr. W. J. Ansorge on March 30th, 1906.

The pale ashy-grey colour of the fur and entire absence of dark markings on the muzzle, together with the general cranial characters noted above, readily distinguish this Angolan dormouse from *G. murinus* and the allied forms. In general colour, *ansorgei* approximates to the pale coloration of the Kalahari species, *G. woosnami*; the two forms, however, do not in any way appear to be closely allied, *woosnami* being a much larger animal with a different form of skull. *G. kelleni*, described by Reuvens from Damara Land, would appear to be much darker in colour and smaller in size than this new Angolan species.

*Graphiurus brockmani internus*, subsp. n.

About equal in size to *G. brockmani*, Dollm., darker in colour and with ocular rings and dark markings on muzzle more evident.

General proportions as in *brockmani*. Fur rather harsher, the hairs all comparatively short. Colour of back much as in *microtis* but rather less yellow, the whole back suffused with a brownish tint, the general effect resembling that met with in *microtis saturatus*, but paler and less slate-coloured (near smoke-grey no. 4 mixed with snuff-brown no. 1, 'Répertoire'). Hairs of back with slate-grey bases, pale buff subterminal rings, and brownish tips. Flanks more strongly tinted with buff than rest of dorsal surface, sharply contrasting with the white under surface, the contrast rather more marked than in *brockmani* owing to the darker colour of the flanks. Face and nasal region lighter than rest of upper parts. Dark ocular rings more in evidence than in the Somali form; dark markings on sides of muzzle fairly well defined, but not to such a marked extent as in *microtis saturatus*. Cheeks white; hairs, as in *brockmani*, white almost to roots. Sides of neck below ears white; hairs white with greyish bases. Backs of hands and feet white. Entire under parts white, faintly tinted with pale buff; hairs of belly with slate-grey bases and whitish tips. Tail about as in *brockmani*, rather darker in colour, especially on the ventral surface.

Skull very like that of *brockmani*.

Dimensions of the type (measured in the flesh) :—

Head and body 86 mm.; tail broken\*; hind foot 15; ear 14.

\* Tail in another specimen from Eusso Nyiro given as 75 mm. in length.



Skull: greatest length 24.9; basilar length 18.5; condylo-basilar length 20.7; condylo-incisive length 22; zygomatic breadth 13.5; interorbital constriction 4; squamosal breadth of brain-case 11.8; greatest occipital breadth 11; length of nasals 9; greatest anterior breadth of nasals 3.3; palatilar length 7.5; width of palate (inside  $m^1$ ) 2.9; width across palate (outside  $m^1$ ) 5.1; length of palatal foramina 3; postpalatal length 11.2; length of upper cheek-teeth 3.

*Hab.* Nyama Nyango, Eusso Nyiro, British East Africa. Altitude 3200 feet.

*Type.* Adult female. Original number 195. Collected on February 1st, 1911, by Mr. A. Blaney Percival.

In addition to the type Mr. Percival obtained four further specimens of this new dormouse—three from the type locality, and one from the Mara River. It is interesting to find a close ally of the Somali *Graphiurus* extending into British East Africa; the dormice collected by Mr. Percival as far east as Marsabit represented the true British East-African form, *micrulus saturatus*, and were in no way related to this new race of *brockmani*.

### *Graphiurus butleri*, sp. n.

A light ashy-grey-coloured species about equal in size to *murinus*.

Skin-dimensions fairly large; hind foot large, measuring 17.7 mm. in length. General colour of dorsal surface pale ashy grey (smoke-grey no. 3 tinted with otter-brown no. 1, 'Répertoire'), quite as pale as in *woosnami*, but washed over with a light ash-coloured tint. Hairs of back with slate-grey bases, light buffy-white subterminal rings, and liver-coloured tips, in some cases darkening to brown at the extreme ends of the hairs. Flanks rather more buffy than back; line of demarcation between flanks and light ventral surface irregular and ill-defined. Muzzle and head paler and greyer than back. Dark ocular rings present, but not in any way conspicuous; dark markings on sides of muzzle very faint. Cheeks and sides of neck pure white; hairs all with grey bases and white tips. Backs of hands and feet white. Ventral surface of body pale slate-grey, washed over with white and faintly tinted with a pale cream-coloured wash. Tail pale liver-coloured, lighter below than above. Hairs at distal end tipped with white; this may be an abnormal condition, as the tail appears to be of the regenerated kind and therefore the true tail tip is wanting.

Skull like that of *G. woosnami*, but smaller, possessing

the same flat brain-case and the constricted interorbital region.

Dimensions of the type (measured from the dry skin):—

Head and body 110 mm.; tail 63\* ; hind foot 17·7 ; ear 14.

Skull : greatest length 28·6 ; basilar length 22 ; condylo-basilar length 24 ; condylo-incisive length 26 ; zygomatic breadth 15·3 ; interorbital constriction 4 ; squamosal breadth of brain-case 11·9 ; greatest occipital breadth 12·3 ; greatest length of nasals 11·4 ; greatest anterior width across nasals 3·9 ; palatilar length 9 ; width of palate (inside  $m^1$ ) 3·7 ; width across palate (outside  $m^1$ ) 5·8 ; length of palatal foramina 3·7 ; postpalatal length 13 ; length of upper tooth-row 3·3.

*Hab.* Jebel Ahmed Aga, Sudan.

*Type.* Adult male. B.M. no. 11. 11. 25. 84. Original number 168. Collected by Mr. A. L. Butler on January 10th, 1910.

This Sudan dormouse is evidently closely related to *G. woosnami*, a species recently founded on a specimen collected by Mr. B. Woosnam in the Kalahari Desert, South Africa.

There is considerable difference in the colour of the two forms, the ashy suffusion which dominates the general greyish tint in *butleri* is almost entirely absent in *woosnami*. In general skin and cranial dimensions *butleri* is conspicuously smaller than the Kalahari species.

Geographically, *G. orobinus*, Wagn., is the nearest relative of Butler's dormouse. *Graphiurus orobinus* is said to come from "Sennaar"; the original description is so incomplete that it is quite impossible to form any definite idea as to the general characters of the species, even supposing it can be referred to this genus. Reuvens was unable to trace the whereabouts of the type and only quotes from Wagner's two descriptions. If *orobinus* is really a *Graphiurus* it would appear to be a darker and smaller species than *butleri*, the hind foot being given as only 10 mm. in length, and therefore it is probably more nearly related to *G. personatus* and the small *parvus* group than to the larger species.

\* Regenerated.

XXXI.—*Descriptions of new Species of Pyralidæ of the Subfamily Pyraustinæ.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from p. 269.]

(11 *b*) *Nosophora bisexualis*, sp. n.

♂. Head and thorax pale fulvous; palpi fuscous, with the hair at extremity of second joint and on third joint black; extremities of fore femora and tibiæ fuscous; abdomen fuscous brown, the base pale fulvous, the ventral surface white. Fore wing pale fulvous suffused with brown except the medial part of costa and inner area; traces of a waved antemedial line; a slight yellowish spot in end of cell; a semihyaline white patch beyond the cell between veins 8 and 2 rather constricted at middle and rounded below, defined except above by brown, on outer side by the faint postmedial line, which is retracted from its lower extremity to origin of vein 2, then sinuous to inner margin; a fine pale line at base of cilia, followed by a dark line. Hind wing ochreous suffused with brown except basal and inner areas; traces of a dark postmedial line from costa to vein 2; a slight pale line at base of cilia.

♀. Yellow tinged with fulvous; vertex of head white; fore wing with the lower extremity of the hyaline patch more produced, the lines more distinct; hind wing with round semihyaline patch beyond the cell defined by brown except above.

*Hab.* SOLOMON Is., Bougainville (*Meek*), 1 ♂, 1 ♀ type. *Exp.* 28 mm.

(11 *a*) *Chalcidoptera trogobasalis*, sp. n.

Antennæ with the base of shaft excised, then thickened, angled, and curved upwards, the terminal part annulate.

Ochreous white; second joint of palpi tinged with fuscous towards extremity; thorax and abdomen dorsally spotted with fuscous. Fore wing with curved subbasal fuscous line, with ill-defined fuscous spots beyond it below costa, in cell, and on inner margin; a curved antemedial line with spot beyond it in cell; the medial part of costa tinged with rufous; a discoidal fuscous bar with a diffused line from it joining the antemedial line at inner margin; some diffused brown spots beyond the cell between veins 7 and 2, bent

outwards below vein 5; the postmedial line slightly incurved from costa to vein 4, then dentate to vein 2, where it is retracted to lower angle of cell and excurved to inner margin, some indistinct spots beyond it towards costa and a dentate line from vein 5 to inner margin, angled inwards in submedian fold. Hind wing with diffused fuscous line from middle of discocellulars to inner margin, connected with some diffused fuscous beyond the cell; the postmedial line sinuous, bent outwards and dentate between veins 5 and 2, then oblique to tornus; the terminal area tinged with fuscous; both wings with strong black terminal line, the cilia fuscous at tips.

*Hab.* S. NIGERIA, Old Calabar (*Crompton*), 1 ♀, Warri (*Roth*), 1 ♂ type, Ilesha (*Humphrey*), 1 ♂, 1 ♀; N. NIGERIA, Borgu, Yelwa Lake (*Migeod*), 1 ♂. *Exp.* 24 mm.

(1 c) *Chalcidoptera thermographa*, n. n.

*Chalcidoptera rufilineatis*, Hampsn. P. Z. S. 1910, p. 497, pl. xl. fig. 23 (nec Swinh.).

(9) *Chalcidoptera argyrophoralis*, sp. n.

♂. Head yellow tinged with rufous and mixed with cupreous brown; thorax cupreous brown; abdomen yellow at base and extremity, the medial segments brown with a silvery gloss on third segment, the anal tuft tinged with brown; palpi at base, pectus, legs, and ventral surface of abdomen white. Fore wing pale yellow; the base brown; a large elliptical brown antemedial patch from costa to inner margin, with silvery scales on its edges; terminal area pale purplish brown, with incurved inner edge with silvery scales on it, forming a large elliptical terminal patch. Hind wing pale yellow, with faint line from lower angle of cell to tornus, where it forms a small black spot; a large rounded pale purplish brown terminal patch from just below costa to vein 2, irrorated with blackish scales on inner side and with silver bar on its inner side from costa to discal fold, followed by some silver scales.

*Hab.* GOLD COAST, Kumasi (*Whiteside*), 1 ♂ type. *Exp.* 22 mm.

(2 a) *Spilomela minoralis*, sp. n.

♂. Head and thorax white with brown streaks on tegulae and dorsum of thorax; palpi and legs tinged with yellow; abdomen white tinged with yellow especially towards extremity, where there is a fuscous patch on anal segment



above. Fore wing semihyaline white; a fuscous brown subbasal band; a slightly curved antemedial band; a postmedial band, oblique and slightly incurved from costa to vein 2, where it is connected with a patch at tornus, then retracted to upper angle of cell and enclosing a white discoidal striga, then erect to middle of inner margin; a wedge-shaped terminal patch, broad at costa and narrowing to a point above vein 2, divided by a white subterminal line arising from below apex. Hind wing semihyaline white, with oblique fuscous medial and postmedial bands from costa to just above tornus; a subterminal band from costa to vein 2 and a terminal band.

*Hab.* BR. GUIANA, Essequibo R., 1 ♂ type. *Exp.* 20 mm.

(7) *Filodes normalis*, sp. n.

Head fulvous, the extremity of second joint of palpi and sides of frons black; thorax fuscous; legs tinged with fulvous, the extremity of fore tibia and fore and mid femora banded with black; abdomen orange above with leaden-grey segmental bands and subdorsal and lateral series of black points, the ventral surface whitish; wings fuscous. Fore wing with fulvous costal fascia; a subbasal black spot on costa; an oblique antemedial line obsolescent except towards costa; a spot in middle of cell and larger round discoidal spot; a postmedial spot on costa with traces of a curved line arising from it. Hind wing with black discoidal spot and indistinct curved postmedial line.

*Hab.* GOLD COAST, Kumasi (*Whiteside*), 1 ♂, 1 ♀ type; S. NIGERIA, Warri (*Roth*); CAMEROONS (*Sjostedt*), 1 ♂. *Exp.* 32 mm.

(3 a) *Tyspanodes albidalis*, sp. n.

♂. Head and thorax white tinged with orange; pectus, legs, and abdomen rather dirty white. Fore wing rather dirty white, the end of cell and area just before apex faintly tinged with yellow; a faint obliquely curved antemedial line, a slight discoidal lunule, and traces of a curved postmedial line; cilia fuscous at base, pure white at tips. Hind wing rather dirty white; cilia fuscous at base, pure white at tips. Underside of fore wing suffused with fuscous brown except the costa and termen.

*Hab.* SOLOMON Is., Bougainville (*Meek*), 1 ♂ type, Choiseul (*Meek*), 1 ♂. *Exp.* 22 mm.

(3 a) *Caprinia trichotarsia*, sp. n.

Hind legs of male with the tibiae fringed with long hair above and below, the tarsi fringed with very long hair above; both wings with the cell very short.

♂. Head, thorax, and abdomen silvery white, the antennae and shoulders pale ochreous brown; palpi silvery grey towards tips; legs tinged with ochreous brown. Fore wing silvery white, the costa tinged with ochreous brown, the costal edge black towards base; a terminal series of fuscous bars. Hind wing semihyaline silvery white, with terminal series of fuscous bars from apex to submedian fold, the costa fuscous towards apex.

*Hab.* DUTCH N. GUINEA, Snow Mts., Up. Setekwa R. (Meek), 1 ♂ type. *Exp.* 40 mm.

(4 a) *Caprinia cuprescens*, sp. n.

♂. Head and thorax cupreous brown mixed with some whitish, the vertex of head whiter; palpi white towards base, black with a silvery gloss towards tips; pectus white; legs whitish suffused with fuscous; abdomen white dorsally tinged with brown, the sides and anal tuft black. Fore wing cupreous brown; a terminal series of black points; cilia with a fine whitish line at base. Hind wing semihyaline white, the terminal area cupreous brown; the underside with the costal area cupreous brown.

*Hab.* NEW GUINEA, Fak-fak (Pratt), 1 ♂ type. *Exp.* 40 mm.

(4 b) *Conchylodes intricata*, sp. n.

Head and thorax white tinged with ochreous; antennae black and with black streaks behind them; tegulae, patagia, and metathorax with black patches; palpi with the second joint black except at extremity; tibiae and tarsi banded with black; abdomen ochreous white dorsally suffused with orange except towards base, a dorsal black spot at base, bar on third segment followed by two small spots, and bar at base of anal segment. Fore wing ochreous white tinged in parts with brownish orange; an incurved subbasal black bar from costa; an oblique antemedial band with its outer edge excised below the cell; a short black streak with a bar from it at middle of costa; a black patch from costa to lower angle of cell with two white discoidal points on it, connected with an annulus below the cell cut by a round

black patch on inner area with white point on it at vein 1 : postmedial line black, expanding into a patch at costa, excurved below costa, incurved at discal fold, excurved at middle, then curved inwards to the round medial patch ; a quadrate black apical patch with small white spot on it below apex, a point at middle of termen and irregular black patch above tornus ; cilia chequered black and white. Hind wing ochreous white ; two slight black discoidal points ; a sinuous postmedial line ending in a small spot above tornus ; a black apical patch and bar at middle of termen ; cilia intersected with black towards apex and with black line near base towards tornus ; the underside with postmedial black spot on costa.

*Hab.* PANAMA, 1 ♂ type ; PERU, Cushi, 1 ♀. *Exp.*, ♂ 22, ♀ 24 mm.

(7 a) *Conchylodes gammaphora*, sp. n.

*Conchylodes strigialis*, Druce, Biol. Centr.-Am., Het. ii. p. 251 (part.), nec Guen.

♀. Head and thorax white ; back of head black ; dorsum of thorax and patagia with black fasciæ ; palpi with the second joint behind and base of third joint fuscous ; fore tibiæ banded with black ; abdomen white, the terminal segments dorsally orange, two black subdorsal fasciæ ending in a dorsal bar on fifth segment, black dorsal points on two terminal segments. Fore wing white ; oblique subbasal and antemedial black bands and an erect medial band ; an elliptical black discoidal spot with a sinuous white striga on it, extending to just below the costa and connected by a bar with the black postmedial band, which is slightly incurved below vein 4 and forming with it a Y-shaped band ; a black subterminal band and band on termen and base of cilia. Hind wing white ; an oblique black medial line ending above an orange patch at tornus ; an oblique black postmedial band with a hook on its inner side arising from vein 3, a subterminal band, and a band on termen and base of cilia all ending at the orange tornal patch.

*Hab.* Mexico, Teapa, Tabasco (*H. H. Smith*), 1 ♀ type, Godman-Salvin Coll. *Exp.* 30 mm.

(11 a) *Conchylodes arcifera*, sp. n.

*Conchylodes platinalis*, Druce, Biol. Centr.-Am., Het. ii. p. 250 (part.), nec Guen.

Head and thorax white, the dorsum of thorax tinged with ochreous brown ; palpi with black spots on the joints ; frons

with black spot; antennæ with the basal joint black behind; shoulders with oblique black bars; fore tibiæ banded with black; abdomen orange, white at base, subdorsal black spots at base, bar on third segment, spot on fourth segment, followed by small spots on the terminal segments, the ventral surface white with small spots on medial segments and sublateral spots on terminal segments. Fore wing white; a wedge-shaped subbasal black bar from costa to vein 1; antemedial line black, expanding into a spot at costa; a small elliptical black annulus at middle of cell extending almost to costa and an elliptical discoidal annulus extending to costa; postmedial line black, slightly dilated at costa, somewhat excurved to vein 1, then retracted to the discoidal annulus and forming a hoop to inner margin, its inner arm erect and dilated into a small spot at inner margin; a slightly curved black subterminal line dilated into a small spot at costa; a black terminal line. Hind wing white; a black discoidal point with oblique line from below it to tornus; postmedial line black, slightly incurved to submedian fold, where it forms a hook on its inner side arising from vein 3; a black subterminal line dilated into a spot at costa and a terminal line, both ending at submedian fold.

*Hab.* MEXICO, Durango (*Forrer*), 1 ♂, Guerrero (*H. H. Smith*), 1 ♀; GUATEMALA, Zapote (*Champion*), 1 ♀, San Geronimo (*Champion*), 1 ♂ type; NICARAGUA, Chontales (*Janson*), 1 ♂, Godman-Salvin Coll. *Exp.* 28-34 mm.

(11 b) *Conchylodes terminipuncta*, sp. n.

*Conchylodes platinalis*, Druce, Biol. Centr.-Am., Het. ii. p. 250 (part.), nec Guen.

Head and thorax white, the dorsum of thorax tinged with brown; palpi with small lateral black spots on second and third joints; frons with black spot; basal joint of antennæ with small black spot behind; patagia with black streaks; fore tibiæ banded with black; abdomen orange, white at base, a slight black bar at base, bar on third segment, patch on fourth segment followed by small spots on terminal segments and wedge-shaped patch on anal segment, the ventral surface white, with sublateral black points on terminal segments. Fore wing white: a subbasal black spot below costa; an antemedial black spot below costa, with line from it to inner margin slightly excurved below the cell; an elliptical black spot at middle of cell and elliptical discoidal annulus; postmedial line black, dilated into a spot at costa, excurved and sinuous to vein 1, then retracted to below the discoidal



annulus and forming a hoop to inner margin, where it is bent inwards and dilated; a black subterminal line, expanding into a spot at costa and connected by a spot at discal fold with the black terminal line. Hind wing white, a black discoidal point with oblique line from below it to inner margin before tornus; postmedial line fine, black, oblique to vein 1, where it forms a hook on its inner side arising from vein 3; a fine black subterminal line expanding into spots at apex and tornus; a fine black terminal line.

*Hab.* MEXICO, Tabasco, Teapa (*H. H. Smith*), 1 ♂ type; GUATEMALA, Vera Paz (*Champion*), 1 ♂, 1 ♀, Panima (*Champion*), 1 ♂, 1 ♀; COSTA RICA, Irazu (*Rogers*), 2 ♂, Godman-Salvin Coll. *Exp.* 24–28 mm.

(11 c) *Conchylodes stictiperalis*, sp. n.

♀. Head and thorax white, the back of head and dorsum of thorax suffused with brown; palpi with black spots at sides of first and second joints; frons with black spot; basal joint of antennæ with small black spot behind; patagia with black streaks; fore tibiæ banded with black; abdomen white, the terminal segments dorsally tinged with orange, a brown bar on third segment. Fore wing white; a subbasal black band from costa to vein 1; antemedial line black, expanding into a small spot at costa; an elliptical spot below middle of costa, with slight whitish centre and an elliptical discoidal annulus; postmedial line black, expanding into a lunule below costa, slightly excurved to vein 2, then retracted to the discoidal annulus and curved inwards to inner margin, above which it is dilated into a spot; a subapical black spot, small subterminal spots above and below vein 5, points above veins 3 and 2, and a bar in submedian interspace; a terminal series of black striæ. Hind wing white; a small black discoidal spot with oblique line from below it to inner margin before tornus; an oblique postmedial line from below costa to vein 2; a black apical spot with the fine subterminal line arising from it and slightly incurved below vein 2; a black terminal line broken up into striæ at middle.

*Hab.* BRAZIL, Pará, 1 ♀ type. *Exp.* 30 mm.

(2 a) *Dichogama obsolescens*, sp. n.

♂. Head and thorax yellowish white; antennæ fuscous; abdomen yellowish white, faintly tinged with rufous towards extremity. Fore wing yellowish white; antemedial line represented by an oblique black striga from vein 1 to inner margin; a slight oblique black striga at lower angle of cell,

representing part of the discoidal annulus, and slight streaks of black scales in the interspaces beyond the cell ending in minute scale-points, representing the excurved part of the postmedial line which forms an oblique black striga from vein 1 to inner margin near the antemedial striga; some black points just before termen from below apex to vein 3; cilia brownish at tips. Hind wing hyaline white, the costa and cilia yellowish white. Underside of fore wing with brown discoidal lunule, with some suffusion above it and postmedial bar from below costa to vein 6.

*Hab.* GRENADA (*H. H. Smith*), 1 ♂ type. *Exp.* 36 mm.

(4a) *Phryganodes tridentalis*, sp. n.

Antennæ of male with a small dilation fringed with hair above at one-third, then somewhat contorted.

♂. Head and thorax fuscous brown; palpi blackish; pectus and legs grey-brown, the hind tarsi white; abdomen grey-brown, the anal tuft and ventral surface white. Fore wing fuscous brown with a cupreous gloss; a diffused oblique dark antemedial line slightly angled inwards above inner margin; a dark spot in middle of cell and round discoidal patch with greyish striga on it; postmedial line indistinct, dark diffused, with slight white streaks before it above veins 6 and 5, then with three dentate white marks before it between veins 5 and 2, then bent inwards to origin of vein 2 and erect to inner margin; a fine pale line at base of cilia. Hind wing with the basal half semihyaline whitish suffused with brown, the terminal half fuscous brown with a cupreous gloss, narrowing to tornus; a blackish discoidal spot with oblique diffused line from it to inner margin towards tornus; a fine whitish line at base of cilia; the underside with dark postmedial line, sinuous towards costa, excurved and waved between veins 5 and 2, then bent inwards to below end of cell.

*Hab.* PERU, El Porvenir, 1 ♂ type. *Exp.* 38 mm.

(6b) *Phryganodes rotundalis*, sp. n.

Fore wing with the apex more rounded and not produced.

♂. Yellowish white; abdomen with fuscous dorsal patches. Fore wing with brown costal fascia expanding slightly above end of cell; a brown discoidal lunule; a brown fascia below vein 2 from cell to termen; the terminal area suffused with brown narrowing to tornus. Hind wing with large brown apical patch extending below the costa to discocellulars and to vein 3, the terminal line extending to submedian fold.

*Hab.* Surinam (*Ellacombe*), Inquitos (*Stuart*), 1 ♂ type. *Exp.* 28 mm.

(8 a) *Phryganodes lasiocnemis*, sp. n.

Fore, mid, and hind femora, tibiae, and first joint of tarsi fringed with long hair.

Head, thorax, and abdomen red-brown, the last with the anal tuft blackish, the ventral surface pure white edged with blackish; the tarsi white, the fringes of hair on fore and mid legs pale rufous. Fore wing reddish brown; an obliquely curved dark antemedial line; a dark point in middle of cell and oblique discoidal bar; postmedial line dark, slightly excurved below costa, at vein 2 retracted to below end of cell, and almost obsolete, then erect; cilia white at tips towards tornus. Hind wing reddish brown; an oblique dark discoidal bar; postmedial line dark, excurved from below costa to vein 2, then retracted and oblique to submedian fold. Underside of fore wing with the postmedial line punctiform, incurved between veins 5 and 3, and retracted at vein 2; hind wing with the postmedial line punctiform and sinuous.

*Hab.* BR. N. GUINEA, Ekeikei (*Pratt*), 6 ♂, 3 ♀ type, Mafalu (*Pratt*), 1 ♀. *Exp.* 34-42 mm.

(10 a) *Phryganodes leucogaster*, sp. n.

Mid and hind tarsi of male not fringed with hair.

Head, thorax, and abdomen pale red-brown, the last with the ventral surface pure white; palpi at base and pectus yellowish, the fore tibiae and the tarsi white. Fore wing pale red-brown; an obliquely curved dark antemedial line; a dark discoidal bar; postmedial line dark, excurved below costa, slightly waved at middle, below vein 3 retracted to below end of cell and again slightly excurved; a punctiform dark terminal line; cilia with dark line at middle and pure white tips except at middle. Hind wing pale red-brown; an oblique dark discoidal bar; postmedial line dark, excurved to vein 3, then retracted and oblique to submedian fold; a slight dark terminal line; cilia with a dark line at middle and white tips except at middle. Underside of both wings with the postmedial line punctiform and incurved below vein 3.

*Ab.* 1. With a greyish-fuscous tinge, the abdomen with the anal tuft blackish, the ventral surface tinged with pale pink.—Nias I.

*Hab.* NIAS I., 1 ♂; BORNEO, Sarawak (*Wallace*), 1 ♀; PULO LAUT (*Doherty*), 1 ♂ type. *Exp.* 30-36 mm.

(10 b) *Phryganodes fuscicilia*, sp. n.

♂. Head, thorax, and abdomen fuscous brown, the last with the anal tuft blackish, the ventral surface pure white edged with black; palpi at base and pectus ochreous; tarsi white. Fore wing fuscous brown with a greyish tinge; antemedial line dark, oblique; a dark discoidal bar; postmedial line dark, excurved below costa, at vein 2 retracted to below end of cell and almost obsolete, then slightly excurved; a rather punctiform dark terminal line and slight pale line at base of cilia. Hind wing fuscous brown with a greyish gloss; a dark discoidal bar; postmedial line dark, excurved and slightly waved to vein 3, then retracted and oblique to submedian fold; a dark terminal line and slight pale line at base of cilia. Underside of both wings with the postmedial line punctiform and incurved below vein 3, on fore wing incurved at vein 4.

Ab. 1. Redder brown; legs with the fringes of hair yellowish.—St. Aignan.

*Hab.* BR. N. GUINEA, Mt. Kebea (*Pratt*), 1 ♂ type; LOUISIADES, St. Aignan (*Meek*), 1 ♂. *Exp.* 34 mm.

(15 a) *Phryganodes samealis*, sp. n.

Hind femora of male with a large tuft of scales near extremity, the base of tibia with slight fringe of scales on inner side; tegulae with tufts of long scales extending well beyond metathorax; abdomen with large tufts of scales at base on ventral surface and lateral tufts of long hair towards extremity; hind wing with the tornus strongly lobed, distorted, and with tufts of hair.

Head and thorax ochreous white; blackish patches on first and second joints of palpi, tegulae, and shoulders; the patagial tufts brownish; femora and tibiae with blackish marks and the tufts of scales black; abdomen with blackish dorsal marks towards base, the terminal segments blackish with white segmental lines. Fore wing ochreous white, the disk semihyaline white; a blackish spot at base of costa; a diffused antemedial band composed of two ill-defined lines with another line beyond it angled below cell; a small annulus in middle of cell; a large discoidal patch extending to costa and with a slight pale lunule on it; the postmedial line excurved from costa to vein 5 where it is angled inwards, excurved again to vein 2, retracted to lower angle of cell where it encloses a small pale triangular mark, then oblique to middle of inner margin; the terminal area blackish with a series of pale spots beyond the postmedial



line. Hind wing semihyaline whitish; a small tuft of dark scales near base of median nervure; a blackish discoidal annulus; the postmedial line slightly waved from costa to vein 2 where it is retracted to lower angle of cell, then oblique to tornus where the tufts of hair are black; apical area black, narrowing to a point at vein 2.

*Hab.* BR. GUIANA (*Kaye*), 1 ♀; SURINAM, Paramaribo (*Ellacombe*); BRAZIL, Amazons, 1 ♂ type. *Exp.* 28 mm.

(16 a) *Phryganodes tetrastictalis*, sp. n.

Hind tibia of male strongly curved towards extremity and fringed with long hair above, with short hair below.

♂. Head, thorax and abdomen orange mixed with brown; fore tibiae with black band at extremity; abdomen with orange lateral tufts, the ventral surface pale. Fore wing brown; slight orange and black markings at base; a triangular orange patch on costa just beyond middle, extending to submedian fold and with black discoidal spot on it. Hind wing brown with orange patch in, beyond, and below end of cell; a black spot at lower angle of cell.

♀. Orange; wings with black discoidal spots; the terminal area brown, with somewhat sinuous blackish line on its inner edge.

*Hab.* GOLD COAST, Kumasi (*Whiteside*), 1 ♀; S. NIGERIA, Old Calabar (*Crompton*), 1 ♂ type, Warri (*Roth*), Sapele (*Sampson*), 1 ♀. *Exp.* 30-32 mm.

(16 b) \**Phryganodes metalobalis*, sp. n.

♂. Hind tibiae fringed with hair, with tuft of long hair from base and a tuft from coxa; a tuft of hair from pectus near origin of hind wing, of which the tornal area is produced into a very large rounded lobe.

Cupreous brown; neck with some orange scales; tarsi pale; anal tuft ochreous.

*Hab.* BR. GUIANA, Fort George, type in Coll. Rothschild. *Exp.* 44 mm.

(16 a) *Phryganodes truncatalis*, sp. n.

Hind wing with the costa short, the apex acute and the termen excised below it.

♂. Uniform brown with a cupreous gloss; tarsi whitish; cilia of both wings with the tips slightly whitish.

*Hab.* PANAMA, La Chorrera (*Dolby-Tyler*), 1 ♂ type. *Exp.* 32 mm.

(52 a) *Phryganodes selenophora*, sp. n.

♂. Head pale red-brown; thorax and abdomen dark red-brown, the last with slight dorsal white segmental lines and large pale ochreous genital tuft; palpi at base, pectus and legs white. Fore wing dark red-brown, the medial part of costa bright yellow extending to just before the antemedial line which is dark brown, slightly bent outwards below costa, then oblique; a silvery-white discoidal lunule, its inner edge slightly indented above where it is conjoined to the yellow costal area; postmedial line dark brown, excurved and slightly dentate to vein 4, then bent inwards to below end of cell and oblique to inner margin; the termen excised below apex and excurved at middle; a fine pale line at base of cilia. Hind wing dark red-brown; postmedial line dark, straight to vein 2, then bent inwards to lower angle of cell and oblique to inner margin near tornus; cilia with fine white line at base and white tips; the underside greyish with blackish discoidal lunule and punctiform sinuous postmedial line.

*Hab.* W. COLOMBIA, Jiminez, 1 ♂ type. *Exp.* 32 mm.

(57 a) *Phryganodes cupriflavalis*, sp. n.

Head, thorax, and abdomen pale yellow, the sides of head and front of thorax tinged with red-brown; palpi at base, pectus and ventral surface of abdomen white; the fore tibiae with fuscous band. Fore wing cupreous brown, with oblique wedge-shaped pale yellow patch from beyond upper angle of cell to medial part of inner margin; a slight dark discoidal lunule. Hind wing pale yellow, the terminal area cupreous brown; cilia whitish at tips.

*Hab.* SINGAPORE (*Ridley*), 10 ♂, 2 ♀ type; SAMBAWA (*Doherty*), 1 ♂. *Exp.* 26 mm.

(55 d) *Phryganodes glyphodoides*, sp. n.

♂. Head and thorax fuscous brown with a greyish gloss; palpi at base and throat yellowish white; abdomen whitish tinged with brown, the ventral surface brown. Fore wing cupreous brown; a small antemedial white spot in cell, a medial bar from subcostal nervure to submedian fold, and an elliptical postmedial patch between veins 7 and 3; cilia with fine whitish line at base, the tips white towards tornus. Hind wing pure white with cupreous brown terminal band narrowing to tornus; cilia white with cupreous brown band near base; the underside with the costal area cupreous brown conjoined to a small spot at upper angle of cell.

*Hab.* W. COLOMBIA, Jiminez, 1 ♂ type. *Exp.* 28 mm.

(64a) *Phryganodes atrisignalis*, sp. n.

Head, thorax, and abdomen whitish suffused with pale rufous; palpi tinged with fuscous, white at base; pectus, legs, and ventral surface of abdomen white, the fore tibiae with fuscous band. Fore wing brownish grey with a slight cupreous tinge; an indistinct curved fuscous antemedial line; a small blackish spot at middle of cell and discoidal bar; postmedial line indistinct, fuscous, slightly incurved below costa and excurved between veins 5 and 2, then bent inwards to below end of cell and erect to inner margin; a fine whitish line at base of cilia. Hind wing brownish grey with a slight cupreous tinge; an oblique blackish discoidal striga; postmedial line indistinct, dark, excurved between veins 5 and 2, then retracted to below end of cell and oblique to above tornus; a blackish terminal line and fine whitish line at base of cilia; the underside whiter.

*Hab.* SINGAPORE (Ridley), 3 ♂, 3 ♀ type. *Exp.* 30-38 mm.

(64b) *Phryganodes tridentalis*, sp. n.

♂. Head, thorax, and abdomen fulvous brown; pectus and ventral surface of abdomen whitish; fore tibiae with black band at extremity. Fore wing fulvous brown with slight fuscous suffusion, except on costal area to postmedial line, the costal edge fuscous; an obliquely curved fuscous antemedial line; a black point in middle of cell and discoidal lunule; postmedial line fuscous, bent outwards and produced to teeth below veins 5, 4, 3, then retracted to below end of cell and slightly angled outwards in submedian fold; a terminal fuscous line and slight pale line at base of cilia. Hind wing greyish brown suffused with fuscous; an oblique discoidal bar; postmedial line rather diffused, fuscous, bent outwards and produced to long teeth below veins 5, 4, 3; a terminal fuscous line and pale line at base of cilia.

*Hab.* GOLD COAST, Kumasi (Whiteside), 1 ♂ type. *Exp.* 34 mm.

(2) \**Oligocentris uniformalis*, sp. n.

♂. Uniform bright ochreous yellow; palpi with the second joint black above; fore tibiae banded with black at extremity. Fore wing with traces of discoidal dark point.

*Hab.* SULA MANGOLI (Doherty), type in Coll. Rothschild. *Exp.* 26 mm.

(6a) *Dichocrocis xanthoplagalis*, sp. n.

Hind wing of male with a fringe of long hair on vein 1 on underside, dark at base, fulvous towards tornus, which is truncate, with a tuft of long black hair from just before it.

♂. Dark brown; palpi yellowish at base; fore tibiae yellowish with black band, the tarsi yellowish; abdomen with the ventral surface yellowish to beyond middle, the genital tuft yellowish. Fore wing with somewhat triangular orange discoidal patch extending from below the costa to submedian fold, with a dark bar on discocellulars. Hind wing with small orange spot at lower angle of cell.

*Hab.* S. NIGERIA, Lagos (*H. Strachan*), 1 ♂ type. *Exp.* 28 mm.

(8 c) *Dichocrocis nigricinctalis*, sp. n.

♂. Orange; fore tibiae black at extremity; mid tibiae black at base; abdomen with dorsal black band on penultimate segment, the two segments before it with lateral bars. Fore wing with oblique subbasal black bar from costa; a strong curved antemedial black line; a discoidal striga; a strong black postmedial line, straight from costa to vein 2 where it is somewhat retracted and with black irroration before it between veins 6 and 2. Hind wing with black postmedial line, straight and outwardly diffused from costa to vein 2 where it is angled inwards, then again excurved.

*Hab.* TROBRIAND Is., Kiriwini (*Meek*), 1 ♂ type. *Exp.* 20 mm.

(12 a) *Dichocrocis usticinctalis*, sp. n.

♂. Orange-yellow; palpi black at tips; tegulae black at inner side and at tips; patagia extending to well beyond metathorax, red-brown at tips; fore tibiae with black spot at extremity; metathorax with black spot; abdomen with pair of dorsal black spots on first segment, a band on second, spot on third, and patches on fourth and fifth, sublateral series of black points and a ventral line at base of anal segment. Fore wing with black spot at base: an antemedial bar from costa to median nervure bent inwards to costa and a red-brown band below it from submedian fold to inner margin followed by a black bar; a black point in middle of cell and small discoidal lunule; postmedial line black, obsolescent except at costa and towards inner margin, straight from costa to vein 4, then strongly incurved, followed by a broad band of red-brown suffusion except towards costa; the costal edge slightly tinged with fuscous towards apex. Hind wing with straight diffused blackish postmedial line from vein 6 to near inner margin followed by a broad band of red-brown suffusion.

*Hab.* MASHONALAND, Umtali (*Marshall*), 1 ♂ type. *Exp.* 24 mm.



(13 a) *Dichocrocis loxophora*, sp. n.

♂. Head, thorax, and abdomen yellow; fore tibiæ with black band; abdomen with subbasal black points on second, third, and fourth segments and ventral black bars on four terminal segments. Fore wing yellow; a blackish point below base of costa; an inwardly oblique blackish antemedial line; a black postmedial striga from costa and inwardly oblique series of points from it to inner margin; a subterminal series of points from vein 7 to inner margin, the points at discal fold and inner margin further from termen. Hind wing yellow; a slight discoidal blackish point; a black postmedial bar from inner margin; a series of points from costa beyond middle to termen near tornus and a subterminal point above vein 2.

*Hab.* BALI (*Doherty*), 1 ♂ type. *Exp.* 20 mm.

(26 a) \**Dichocrocis philippinensis*, sp. n.

White; palpi banded with pale fulvous yellow; tegulæ, patagia, and base of abdomen spotted with pale orange, the terminal part of abdomen banded with orange and with a black dorsal band on terminal segment. Fore wing with orange-fulvous spot on base of costal area; curved subbasal and antemedial orange bands; a spot in middle of cell and discoidal bar; the postmedial line incurved from costa to vein 5, where it emits a short spur on inner side, then excurved to vein 2, where it is retracted to lower angle of cell and expands into a diffused spot, and erect to inner margin; a terminal band expanding somewhat towards costa and largely on inner margin. Hind wing with orange-fulvous subbasal spot; a diffused band from middle of cell to above tornus; a large discoidal spot; the postmedial diffused band angled inwards in discal fold to the discoidal spot, then excurved to vein 2 where it is retracted to lower angle of cell; a terminal band expanding somewhat towards costa and into a patch towards tornus; cilia of both wings with an orange line through them.

*Hab.* PHILIPPINES, Manilla (*Whitehead*), type in Coll. Rothschild. *Exp.* 16 mm.

(35 a) *Dichocrocis albilunalis*, sp. n.

♀. Head and thorax white; palpi tinged with brown; shoulders brown; abdomen pale cupreous brown, white at base of dorsum. Fore wing pale cupreous brown; an oblique black antemedial line from below costa to inner margin; a pure white discoidal lunule with slight fuscous

marks on its inner and outer edges at middle; postmedial line black, excurved from costa to vein 2, then bent inwards to below end of cell and erect to inner margin: a terminal series of black points. Hind wing white, the terminal area tinged with pale brown; an indistinct curved crenulate postmedial line from costa to below vein 3; a terminal series of black points from apex to vein 2: cilia white, with a brownish line through them from apex to vein 2: the underside with the postmedial line distinct, black, angled outwards below vein 7.

*Hab.* BR. N. GUINEA, Dinawa (*Pratt*), 1 ♂ type. *Exp.* 30 mm.

[To be continued.]

XXXII.—*On the Geographical Distribution of the Genus Perionyx.* By Dr. LUIGI COGNETTI DE MARTIS, R. Museo Zoologico, Torino.

IN a paper recently published in this Journal\* I gave a description of a new species of *Perionyx* from Shoe Island, near the Auckland Island, and I mentioned that the genus *Perionyx* "was only known from the Philippine and Sunda Islands, from the Indian Empire, Himalaya (11,900'), Ceylon, and Madagascar." Prof. W. Michaelsen, of the Museum of Hamburg, has recently † made a revision of this genus, including in it the genus *Perionychella* ‡ and a species from the Auckland Island which Prof. W. B. Benham, of the University of Otago, described § under the name of *Diporocheta perionychopsis*. By the addition of these species the geographical distribution of the genus *Perionyx* is of course greatly amplified. To the localities mentioned in my paper there must be added:—North Queensland, Victoria, Tasmania, and Auckland Islands.

\* Ser. 8, vol. ix., January 1912, pp. 67–69.

† "Die Oligochätenfauna der vorderindisch-ceylonischen Region." in *Abh. nat. Ver. Hamburg*, xix. 5 Hft. 1910, pp. 58–60.

‡ The genus *Perionychella* was founded by Michaelsen in 1907: *cf.* 'Die Fauna Südwest-Australiens,' Bd. i. Lief. 2, p. 163; see also Michaelsen, in *Mt. Mus. Hamburg*, Bd. 24, 1907, pp. 154–158, and Michaelsen, in *Mem. Ind. Mus.* vol. i. 1909, pp. 166–174.

§ See in 'Subantarctic Islands of New Zealand,' Art. xii., 1909, pp. 286–289.

## XXXIII.—Notes on Fossorial Hymenoptera.—VII.

By ROWLAND E. TURNER, F.Z.S., F.E.S.

*On the Genus Stizus, Latr.*

THE following notes on the genus *Stizus* are the result of a rearrangement of the material in the National Collection. Something yet remains to be done in the difficult *tridens* group of the genus, but in the other groups the notes are fairly complete on the material available. I follow Handlirsch in his definition of the genus, though I have no doubt that it will eventually be subdivided. Ashmead's classification is evidently based on an insufficient collection, and does not provide for some of Handlirsch's groups. Small genera would have to be formed for more than one of these to make the classification complete, and I agree with Handlirsch that it is better to postpone such action until larger collections are available. Most of the African material is from the African Entomological Research Committee.

*Stizus cyanescens*, Rad.

*Stizus cyanescens*, Rad. Horæ soc. ent. Ross. xxi. p. 96 (1877).

This species occurs in S.W. Persia and also as far east as Karachi.

*Stizus comberi*, sp. n.

♂. Niger, iridescent; mandibulis basi, labro, clypeo, fronte sub antennis, scapo subtus, pronoto postico angustissime, segmentis dorsalibus 1-6 fascia angusta apicali, ventralibus 2-6 macula transversa utrinque, tibiis subtus tarsisque pallide flavis; alis hyalinis, costa leviter infuscata, venis nigris.  
Long. 10 mm.

♂. Mandibles with a tooth on the inner margin near the apex; clypeus nearly three times as broad as long; eyes strongly convergent towards the clypeus, at the base of which they are separated by a distance nearly equal to the length of the scape. Antennæ inserted nearer to the eyes than to the base of the clypeus, the apical joints of the same structure as in *S. tridens*, the tenth joint of the flagellum with a spine at the apex, the eleventh strongly curved and a little longer than the tenth, the apical joint only half as long as the eleventh and forming a curved spine. Posterior ocelli only a little further from each other than from the eyes. Median

segment concave posteriorly, the lower angles rather widely excised. Head and thorax very finely and shallowly punctured, median segment and abdomen more closely and strongly punctured. Abdomen a little stouter than in *S. tridens*, seventh ventral segment with a longitudinal carina. Second cubital cell not petiolate, second abscissa of the radius nearly half as long as the first. Hind wing as in *S. tridens*.

*Hab.* Sigiri, Ceylon (*E. Comber*); March 1910.

This belongs to the *tridens* group. It may be distinguished from *tridens* by the deeper incision at the angle of the median segment, by the more robust build, by the broadly rounded apical margin of the sixth ventral segment, and by the distinctly narrower front.

*Stizus simillimus*, Sm.

*Larra simillima*, Sm. Journ. Proc. Linn. Soc., Zool. iii. p. 159 (1859).

♀ (♂).

*Stizus simillimus*, Sm. Sitzungsab. Akad. Wiss. Wien, ci. p. 32 (1892).

*Stizus magretti*, Handl. Sitzungsab. Akad. Wiss. Wien, ci. p. 19 (1892).

I agree with Handlirsch that Smith has probably confused two species in his description, and that his short description of the male refers to another species. But as the main description is of the female, I think his name should stand for the present species, described by Handlirsch as *magretti*.

*Stizus hæmorrhoidalis*, Handl.

*Stizus hæmorrhoidalis*, Handl. Verh. zool.-bot. Ges. Wien, l. p. 472 (1900).

*Hab.* Bothaville and Algoa Bay (*Brauns*); Chirinda Forest, Gazaland (*Odendaal*).

*Stizus nyasæ*, sp. n.

♂. Very nearly related to the N.-African *S. discolor*, Handl., from which it differs in the finer puncturation of the abdomen and in the less compressed angles of the median segment. The ventral surface of the abdomen is entirely unarmed, being without the minute tubercle characteristic of *discolor*. In colour there is little difference, but *nyasæ* has the apical half of the scutellum yellow and the postscutellum black, whereas in *discolor* both are entirely yellow; the colour is in all the markings brighter and clearer in *nyasæ* than in *discolor*. In the female there is never any ferru-



ginous colour at the base of the abdomen, whereas in specimens of *discolor* from Biskra the two basal segments are usually dull ferruginous. I think the two forms must be considered specifically distinct.

Long., ♂ ♀, 12–15 mm.

*Hab.* Lower Luangwa River, N.E. Rhodesia; Karonga, Lake Nyasa (*S. A. Neave*).

The male is the type. The species was submitted to Herr Kohl, who pointed out the affinity with *discolor*. *S. discolor*, Handl., ranges eastward as far as Karachi, where one male was collected by Mr. Comber.

*Stizus caffer*, Sauss.

*Stizus caffer*, Sauss. *Mélanges hyménopt.* p. 28 (1855). ♀.

As Handlirsch suspected, the male shows that this species should be grouped with *haplocerus*, Handl., and not with *loriculatus*, Sm. The male *caffer* is very similar to the female, the antennæ are without spines, the apical joint no longer than the penultimate and slightly curved. Posterior angles of the median segment widely excised.

*Stizus oxydorcus*, Handl.

*Stizus oxydorcus*, Handl. *Verh. zool.-bot. Ges. Wien*, l. p. 472 (1900).  
♀.

*Hab.* Bothaville (*Brauns*); Buluwayo (*G. A. K. Marshall*).

The male differs much more from *clavicornis*, Handl., than the female. There is no sexual difference in the antennæ; the eyes are more strongly convergent than in the female. The prominent tooth on the second ventral segment, which is characteristic of *clavicornis*, is entirely absent in *oxydorcus*; the seventh ventral segment is similar to that of *clavicornis*, but the lateral carinæ are produced into more prominent teeth.

*Stizus escalerae*, sp. n.

♂. *Stizo clavicorni* affinis; niger, flagello antennarum subtus ferrugineo; pedibus pallide flavis, testaceo-variegatis; mandibulis basi, clypeo, fronte sub antennis, scapo, pronoto postice, callis humeralibus, mesopleuris fascia lata antice, segmentis dorsalibus 1–7 fascia lata apicali, prima late emarginata, 2–5 antice bisinuatis, sexta septimaque anguste interruptis, segmento ventrali secundo dimidio apicali, tertio quartoque fascia apicali bisinuata, quinto fascia interrupta pallide flavidulis; alis hyalinis, venis ferrugineis.

Long. 12 mm.

♂. Mandibles with a small tooth on the interior margin near the apex. Clypeus longer than broad, strongly emarginate at the apex, the labrum short. Antennæ separated from the base of the clypeus by a distance equal to a little more than half the length of the scape; flagellum gradually thickened to the apex; the eleventh and tenth joints normal, broader than long; the apical joint rounded at the apex, no longer than the penultimate. Eyes strongly convergent towards the clypeus, separated at the base of the clypeus by a distance scarcely exceeding the length of the scape. Median segment distinctly but not strongly concave on the posterior surface, the angles not excised. Second ventral segment armed with a strong tooth, sixth widely emarginate at the apex, seventh with the sides raised and forming lateral carinæ ending in a blunt tooth. Hypopygium with three short spines. Second cubital cell not petiolate, second abscissa of the radius shorter than the first. Cubitus of the hind wing originating a little before the apex of the submedian cell, from the apex of the median cell only one vein is emitted.

*Hab.* Haut-Kharoum, Kaemenogrà (*Escalera*).

This belongs to the group *clavicornis*, Handl.; the other species of the group are from S. Africa.

*Stizus cinguliger*, Sm.

*Larra cinguligera*, Sm. Cat. Hym. B.M. iv. p. 341 (1856). ♀.

*Stizus clavicornis*, Handl. Sitzungs. Akad. Wiss. Wien, ci. p. 95 (1892). ♂ ♀.

*Stizus tenuicornis*, Sm.

*Larra tenuicornis*, Sm. Cat. Hym. B.M. iv. p. 351 (1856). ♂.

*Stizus tenuicornis*, Handl. Sitzungs. Akad. Wiss. Wien, ci. p. 173 (1892).

*Hab.* Gambia (*Smith*).

This is very near *S. arenarum*, Handl., but has the apical joint of the antennæ scarcely curved and rounded at the apex, whereas in *arenarum* it is distinctly curved and truncate at the apex. The first transverse cubital nervure is straight in both species. Thus *tenuicornis* belongs to the *ruficornis* group.

*Stizus ruficornis*, Fabr.

*Stizus scutellaris*, Kirby, Bull. Liverpool Mus. p. 16 (1900). ♀.

*Hab.* Sokotra.

There can be no doubt that Kirby's name should be sunk as a synonym of this wide-ranging species.

*Stizus fuliginosus*, Klug.*Larra fuliginosa*, Klug, Symb. phys. (1845).*Larra combusta*, Sm. Cat. Hym. B.M. iv. p. 341 (1856).*Stizus fuliginosus*, Handl. Sitzungsab. Akad. Wiss. Wien, ci. p. 163 (1892).*Stizus combustus*, Handl. l. c. p. 179 (1892).

I cannot see that Smith's type of *combusta* from Trebizond differs from N.-African specimens. The species ranges as far as the Gambia River in a south-westerly direction.

*Stizus baumannii*, Handl.*Stizus baumannii*, Handl. Verh. zool.-bot. Ges. Wien, li. p. 503 (1901). ♀.

*Hab.* Dar-es-Salaam (*Handlirsch*) ; Mid Luangwa Valley, N.E. Rhodesia ; Domira Bay, Lake Nyasa (*S. A. Neave*) ; Harar, Abyssinia (*G. Kristensen*).

The male has the apical joint of the antennæ strongly curved, no longer than the penultimate joint. The yellow lateral spots on the abdomen are variable, but seem to be always absent on the second segment of the male, sometimes also on the third segment.

*Stizus fuscipennis*, Sm.*Larra fuscipennis*, Sm. Cat. Hym. B.M. iv. p. 344 (1856). ♂ ♀.*Stizus fuscipennis*, Handl. Sitzungsab. Akad. Wiss. Wien, ci. p. 166 (1892).

This belongs to the *ruficornis* group, the first transverse cubital nervure being straight and the female having a fovea on the scutellum. The male has the clypeus nearly twice as broad as long ; the antennæ separated from the base of the clypeus by a distance slightly exceeding the length of the scape, the eyes slightly convergent towards the clypeus ; the apical joint of the flagellum strongly curved, no longer than the penultimate. In both sexes the abdomen is black, glossed with blue more strongly in the female than in the male, a large yellow spot on each side of the second and third segments, the two apical segments dark ferruginous. The wings are rather pale fuscous, a paler margin reaching into the third cubital cell. In one male there is a spot on the sides of the first dorsal segment.

There are three specimens in the British Museum from Natal ; all are old specimens. It is remarkable that this fine species should not have been received in recent collections.

*Stizus handlirschi*, Rad.

*Stizus handlirschi*, Rad. Hor. soc. ent. Ross. xxvii. p. 62 (1893).

*Hab.* Saraks (*Radoszkowsky*) ; Karachi (*Comber*).

*Stizus pulcherrimus*, Sm.

*Larra pulcherrima*, Sm. Cat. Hym. B.M. iv. p. 348 (1856). ♀.

*Stizus pulcherrimus*, Handl. Sitzungs. Akad. Wiss. Wien, ci. p. 172 (1892).

This belongs to the *fasciatus* group. In the male the apical joint of the antennæ is no longer than the penultimate, slightly curved. The eyes converge slightly towards the clypeus, making the face narrow; the antennæ are separated from the base of the clypeus by a distance not quite equal to the length of the scape. First transverse cubital nervure curved.

*Hab.* N. China, Tientsin (*F. M. Thomson*) ; 1 ♂, May 1906.

*Stizus annulatus*, Klug.

*Larra annulata*, Klug, Symb. Phys. pl. xvi. fig. 7 (1845).

*Larra subapicalis*, Walk. List of Hymen. Egypt, p. 25 (1871).

Walker's name is, I think, without much doubt a synonym of Klug's species, which has a wide range in Western Asia. Walker's record is from Wâdy Ferran.

*Stizus koenigi*, Mor.

*Stizus königi*, Mor. Hor. soc. ent. Ross. xxii. p. 285 (1888). ♂ ♀.

*Stizus tages*, Kirby, Trans. Linn. Soc. (2) v. p. 135 (1889). ♀.

*Stizus koenigii*, Handl. Sitzungs. Akad. Wiss. Wien, ci. p. 125 (1892).

Kirby's name applies to this species, not to *rufiventris*, to which Handlirsch assigns it with doubt.

*Stizus rubellus*, sp. n.

♀. Ferruginea; labro, clypeo, fronte, scapo subtus, pronoto postice, callis humeralibus, mesopleuris macula, tegulis, scutello fascia apicali, postscutello, segmento mediano fascia arcuata, tibiis antice, segmentisque dorsalibus quarto quintoque, interdum etiam secundo tertioque, fascia late interrupta flavis; segmentis dorsalibus 1-3 apice nigricantibus; alis pallide flavo-hyalinis, cellula radiali infuscata, venis fusco-ferrugineis.

Long. 19 mm.

♀. Clypeus nearly three times as broad as long, labrum



rather short; antennae separated from the base of the clypeus by a distance nearly as great as the length of the scape, second joint of the flagellum nearly twice as long as the third, apical joint a little longer than the penultimate. Eyes nearly parallel, posterior ocelli more than half as far again from the eyes as from each other. Very minutely and closely punctured, more finely on the abdomen than on the thorax, the abdomen shining. Anterior tarsi with long spines, intermediate tibiae and tarsi spinose, posterior tibiae and tarsi more feebly spinose. Apical dorsal segment with a pygidial area, very narrowly rounded at the apex. First transverse cubital nervure curved near the cubitus, second strongly curved outwards. Third cubital cell shorter on the radius than on the cubitus, second abscissa of the radius a little shorter than the first.

*Hab.* Nyasaland, Domira Bay; October. N.E. Rhodesia, Ft. Jameson and mouth of Lusangazi River (S. A. Neave); September 1910.

This belongs to the *fasciatus* group, and is without a fovea on the scutellum.

*Stizus neavei*, sp. n.

♂. Niger; labro, clypeo, mandibulis basi, fronte, scapo subtus, marginibus oculorum, inferiore late, exteriore anguste, pronoto, tegulis, mesonoto lateribus, scutello dimidio apicali, postscutello linea transversa, segmento mediano angulis posticis et fascia arcuata, segmento dorsali primo fascia interrupta, segmentis 2-4 fasciis latis subinterruptis, quinto sextoque fasciis continuis, segmento ventrali secundo macula magna utrinque, segmentis 3-6 fasciis latis subinterruptis flavis; pedibus flavis ferrugineo variegatis; scapo supra, flagello, segmento dorsali septimo, segmentisque ventralibus ferrugineis; alis hyalinis, macula radiali fusca, venis ferrugineis.

♀. Mari similis, vertice ferrugineo, segmentis dorsalibus fasciis angustissime interruptis, pygidio macula obscura flava utrinque. Long., ♂ 16 mm., ♀ 18 mm.

♂. Clypeus convex, more than twice as broad as long; antennae inserted rather nearer to the eyes than to the base of the clypeus; second joint of the flagellum scarcely half as long again as the third; apical joint no longer than the penultimate, distinctly curved and truncate at the apex. Eyes distinctly convergent towards the clypeus; the posterior ocelli twice as far from each other as from the eyes. Median segment not concave posteriorly, not excised on the sides. Abdomen not very robust, the ventral segments unarmed. Second abscissa of the radius shorter than the first; cubitus

of the hind wing originating far beyond the transverse median nervure, submedian cell emitting two veins from the apex.

♀. Eyes less distinctly convergent than in the male; apical joint of the flagellum stout and rounded at the apex; scutellum without a fovea; anterior tarsi with very long spines; pygidium rather strongly punctured. Both sexes are finely and very closely punctured. The fuscous radial patch on the fore wing occupies the whole of the radial and the greater part of the second and third cubital cells. The first transverse cubital nervure is very slightly curved.

*Hab.* Mid Luangwa Valley, Upper and Lower Luangwa, N.E. Rhodesia; Valley of N. Rukuru, Karonga District, Nyasaland: July to September (*S. A. Neave*).

Some females from Mid Luangwa have the base of the two basal abdominal segments ferruginous and two short yellow lines on the disc of the mesonotum.

This belongs to the *fasciatus* group.

The male is the type.

*Stizus marshalli*, sp. n.

♀. Nigra; capite, pronoto, mesothorace lateribus, tegulis, scutello, postscutello, segmentis dorsalibus primo (apice excepto), quinto apice, sexto toto, segmentis ventralibus fere totis pedibusque ferrugineis; clypeo, labro, scapo subtus, macula parva utrinque sub ocellis, pronoto margine posteriore anguste, segmento primo dorsali macula parva utrinque, segmentis 2-5 macula magna transversa utrinque flavis; alis flavo-hyalinis, area radiali infuscata, venis ferrugineis.

Long. 23 mm.

♀. Clypeus widely emarginate at the apex, nearly three times as broad as long, almost smooth; the labrum short and strongly punctured. Eyes not convergent towards the clypeus; posterior ocelli nearly twice as far from each other as from the eyes. Antennae gradually thickened towards the apex, second joint of the flagellum twice as long as the third. Scutellum without a distinct fovea. Very minutely punctured; median segment finely rugulose; sixth dorsal segment more coarsely punctured, especially towards the apex, which is narrowly rounded. Second abscissa of the radius longer than the first, but only half as long as the third; submedian cell of the hind wing terminating far beyond the origin of the cubitus. The fuscous mark on the radial area of the fore wing spreads over the greater part of the second and third cubital cells. Pubescence on the thorax short and greyish.

The black portion of the abdomen shows a faint iridescent flush.

*Hab.* Salisbury, Mashonaland, October 1899 (*G. A. K. Marshall*); 1 ♀.

This belongs to the *fasciatus* group, having the first transverse cubital nervure curved and the fovea on the scutellum absent. It is very nearly related to the North-African *S. grandis*, Lep., but, in addition to colour-distinctions, the pygidium is much more strongly punctured in the present species.

*Stizus atrox*, Sm.

*Larra atrox*, Sm. Cat. Hym. B.M. iv. p. 339 (1856). ♀.

*Stizus atrox*, Handl. Sitzungsab. Akad. Wiss. Wien, ci. p. 177 (1892).

*Hab.* Angola (*Monteiro*); Zongwe River, March 1911 (*Oscar Silverlock*); interior of S. Africa (*Smith*).

The specimen in the Silverlock collection differs in having the scutellum and two longitudinal bands on the disc of the mesonotum fulvous. Specimens from the different localities differ perceptibly in the length of the second abscissa of the radius. I have not seen the male.

*Stizus flavomaculatus*, Sm.

*Larra flavomaculata*, Sm. Ann. & Mag. Nat. Hist. (4) xii. p. 404 (1873).

♂.

*Stizus flavomaculatus*, Handl. Sitzungsab. Akad. Wiss. Wien, ci. p. 180 (1892).

*Stizus pentheres*, Handl. Sitzungsab. Akad. Wiss. Wien, civ. p. 995 (1895). ♂.

The yellow markings on the abdomen vary much, being sometimes almost obsolete.

*Stizus tuberculiventris*, sp. n.

♂. Niger; clypeo, segmento dorsali primo fascia lata apicali emarginata, 2-6 fasciis bisinuatis flavis; labro, antennis (articulis 5 apicalibus exceptis), pronoto postice, tegulis, mesonoto anguste lateribus, pedibus, segmento dorsali primo in medio, cæteris margine apicali, septimo toto, segmentisque ventralibus plus minusve ferrugineis; alis sordide hyalinis, margine apicali infuscatis; alis posticis area anali multo post originem venæ cubitalis terminata; segmento tertio ventrali dente valido armato.

Long., ♂ 13 mm., ♀ 15 mm.

♂. Eyes slightly converging towards the clypeus; labrum almost as long as the clypeus, rounded at the apex; clypeus less than twice as broad as long. Antennæ separated from

the base of the clypeus by a distance almost equal to the length of the scape, second joint of the flagellum nearly twice as long as the third. Posterior ocelli nearly twice as far from each other as from the eyes. Thorax very closely punctured rugose; abdomen more finely punctured; the convergent sulci on the median segment distinctly marked. Third ventral segment with a strong slightly curved tubercle near the middle; sixth ventral segment with a minute tubercle near the middle, seventh with a low longitudinal carina in the middle. Second abscissa of the radius a little shorter than the first, third cubital cell almost as long on the radius as on the cubitus. Median cell of the hind wing emitting two nervures from the apex, cubitus originating far before the termination of the submedian cell. Anterior and intermediate tarsi longer than the tibiæ.

♀. As in the male, but the ventral surface of the abdomen is unarmed; the sixth dorsal segment narrowly truncate at the apex. The apical joint of the antennæ is truncate at the apex, not curved; the anterior tarsi with very long spines. The yellow marks on the abdomen are more extensive than in the male, and there is no ferruginous colour on the two basal segments; the apical segment is yellow in the middle. There is no fovea on the scutellum.

The general build of both sexes is slender, as in *pentheres*, Handl., or even more slender.

*Hab.* Salisbury, Mashonaland (*G. A. K. Marshall*), ♂ ♀, April 1900; Simba, British East Africa, 3350 ft., April 1911 (*S. A. Neave*), 1 ♂; Harar, Abyssinia (*G. Kristensen*), 1 ♀.

This is a very distinct species, approaching most nearly to the *fasciatus* group, but distinguished by the armature of the ventral segments of the abdomen of the male, also by the coarse sculpture of the thorax and median segment in both sexes. The first transverse cubital nervure is almost straight, only very feebly bent near the cubitus. The antennæ are considerably thickened towards the apex. In the specimen from Abyssinia the wings are fuscous.

### *Stizus niger*, Rad.

*Stizus niger*, Rad. Journ. Lisboa, xxxi. p. 208 (1881). ♀.

♂. Niger; alis fusco-ceruleis, apice angustissime hyalinis; oculis versus clypeum valide convergentibus.

Long. 22 mm.

♂. Mandibles simple, without a tooth on the inner margin. Eyes convergent towards the clypeus, separated by



a distance equal to rather more than twice the length of the scape on the clypeus and by fully three times the length of the scape on the vertex. Posterior ocelli distinctly further from each other than from the eyes. Clypeus sparsely punctured, widely emarginate at the apex, more than half as long on the median line as the breadth at the base; the exposed portion of the labrum a little shorter than the clypeus and broadly rounded at the apex. Antennæ separated from the base of the clypeus by a distance equal to about two-thirds of the length of the scape; the flagellum gradually thickened towards the apex, the second joint nearly two and a half times as long as the third. Thorax and median segment subopaque, closely punctured; the abdomen shining and more finely punctured, slightly iridescent. Ventral segments sparsely punctured, unarmed. Hypopygium with the usual three apical spines. Second abscissa of the radius very little shorter than the third; second cubital cell receiving the first recurrent nervure slightly beyond the middle and the second just before the apex. Submedian cell of the hind wing extending far beyond the origin of the cubital nervure. Anterior tarsi distinctly ciliated, the basal joint with four rather short spines, the apical spine with another shorter and slenderer beneath. Anterior tibiæ smooth, intermediate and posterior tibiæ feebly spinose. The hyaline area on the anterior wings is very small, commencing at the apex of the radial cell and ending on the outer margin of the wing a little below the cubitus.

*Hab.* Entebbe, Uganda (*Gardney*), September 1910 (A. E. R. C.), 2 ♂♂; Angola (*Welwitsch*).

This belongs to the group *tridentatus*, Fabr., and is most nearly allied to *melanopterus*, Dahlb., and *cyanipennis*, Sauss. It differs from the former in the less coarsely punctured thorax, the much longer second abscissa of the radius, the somewhat broader clypeus, and the presence of a hyaline area at the apex of the wing; from the latter, which I have not seen, and which is only known in the female sex, in the colour of the wings and antennæ and the absence of a carina on the first dorsal segment. Radoszkowsky's description is short, but the points he mentions in comparing his species with *melanopterus* leave little doubt in my mind as to the correctness of my identification.

### *Stizus funebris*, Handl.

*Stizus funebris*, Handl. Verh. zool.-bot. Ges. Wien, 1. p. 473 (1900).

*Hab.* Bothaville, Orange Free State (*Brauns*); Pakasa, Zambesi River (*Oscar Silverlock*).

*Stizus conscriptus*, Nurse.*Stizus conscriptus*, Nurse, Ann. & Mag. Nat. Hist. (7) xi. p. 522 (1903).*Hab.* Karachi (Comber).

This species belongs to the *tridentatus* group. It differs from *blandinns*, Sm., in the absence of the hyaline area at the apex of the wings, the smaller size, the colour of the legs and first abdominal segment, and the somewhat narrower and longer clypeus.

XXXIV.—*Two new Asiatic Voles.*

By OLDFIELD THOMAS.

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*Microtus ilæus*, sp. n.

Essentially like *M. arvalis*, but with markedly larger skull.

Externally very much as in *M. arvalis*; size rather greater; hind foot attaining 19 mm. s. u. Fur rather softer and finer; hairs of back (winter) about 12 mm. in length. General colour lined greyish brown, not distinguishable from that of *arvalis*. Under surface buffy greyish. Tail brown above, greyish white below. Mammæ 2—2=8.

Skull similar in shape to that of *arvalis*, but larger in all dimensions; smoother and more rounded, the ridges and angles less developed, though the anterior corner angles of the brain-case are well marked. Interorbital region broad, smoothly rounded, the oldest specimen with scarcely a trace of commencing ridges. Brain-case large and vaulted.

Teeth essentially as in *arvalis*, but larger and heavier.  $M^2$  in one instance out of five with a slight tendency to the development of an extra postero-internal angle.  $M^3$  quite as in *arvalis*, the typical 4 spaces and a C well defined.  $M_1$  as in *arvalis*, except that in all the specimens the recumbent angles on each side of the anterior trefoil meet in the centre, so as quite to shut off the anterior part of the trefoil from its two united posterior constituents. Numbering the spaces of the tooth from behind forwards therefore, it may be said to have six closed triangles, a seventh and eighth united, and a small subcircular anterior space.

Dimensions of the type (measured in the flesh):—

Head and body 115 mm.; tail 43; hind foot 19; ear 12.

Skull: condylo-basal length 28.2; condylo-incisive length

28.4; zygomatic breadth 16.1; nasals  $7.8 \times 3.2$ ; interorbital breadth 4; length of brain-case from lateral occipital protuberances 14.1; height of crown from alveolus of  $m^2$  8.5; palatilar length 14.2; diastema 8.3; palatal foramina 5.2; upper molar series (crowns) 6.8, (alveoli) 7.1.

*Hab.* Djarkent, Semiretschensk, E. Russian Turkestan. "On the banks of the River Ussek."

*Type.* Adult male. B.M. no. 11.12.14.30. Original number 17. Collected 11th March, 1911, by W. Rückbeil. Presented by the Duke of Bedford, K.G.

The skull of this vole is as much larger than that of Thian-shan and Altai representatives of *M. arvalis* as it is as compared with European examples of that wide-ranging species.

*Microtus (Phaiomys) afghanus*, sp. n.

"*Golunda meltada*," Gray (specimen c), Horsf. Cat. Mamm. Mus. E. I. C. p. 144 (1851).

*Arvicola mandarinus*?, Blanf. J. A. S. B. l. pt. 2, p. 108, pl. ii. fig. C (teeth) (1881); Thos. Trans. Linn. Soc. (2) Zool. v. p. 59 (1889): nec Milne-Edwards.

General characters of *Phaiomys*, but  $m_1$  more as in *Pitymys*. Bullæ unusually large. Size rather smaller than in *M. blythii*. Fur straight, fairly coarse, not mole-like. Colour above more or less buffy, but as the original Griffith's skin is old and faded, and the more recent specimens are in spirit, an exact description of the colour cannot be given; Blanford calls it "light greyish rufescent brown." Under surface broadly washed with buffy whitish. Ears short, rounded. Claws of fore and hind feet fairly long, subequal; sole-pads 6. Mammæ 2—2=8.

Skull, as compared with that of *M. blythii*, with shorter nasals. Broader, flatter, and less ridged interorbital region, and very much larger bullæ, which project out beyond the occipital face of the skull about as in *Lagurus*.

Teeth on the whole much as in *M. blythii*;  $m^3$  similarly with three triangles and a V instead of the four triangles and a C characteristic of *Pitymys*. But  $m_1$  is more as in *Pitymys*, for the combined fifth and sixth space (counting from behind\*, and including the posterior transverse triangle) is nearly or quite shut off from the anterior space, the latter being, however, intermediate between the well-defined

\* I have always thought this the best way to count the spaces on this tooth, and am pleased to find that Dr. Büchner has done the same in his work on the Prejevalsky mammals. Mr. Miller omits the posterior transverse space, for reasons which do not convince me.

angular trefoil of *Pitymys* and the simple rounded space of *Phaiomys*.  $M^3$  has 3 outer and 3 inner angles,  $m_1$  4 outer and 5 inner, but both above and below there is room for difference of opinion as to what should be counted and what not.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 93 mm.; tail 23; hind foot 16.5; ear 9.

Skull: condylo-basal length 25.5; condylo-incisive length 26.5; nasals  $6.6 \times 2.9$ ; interorbital breadth 4.2; palatilar length 13.6; palatal foramina 4.6; diastema 8.3; upper molar series (crowns) 6.1.

*Hab.* Afghanistan. Type from Gulran.

*Type.* Adult female in alcohol. B.M. no. 86.10.15.11. Collected 1st April, 1885, by Dr. J. E. T. Aitchison; presented by the Afghan Boundary Commission. A male from the same place and a skin from "Afghanistan" also examined.

The Afghan vole has been known for a great many years, owing to the fact that a specimen of it was obtained by Mr. William Griffith during his Mission to Afghanistan in 1843, and was included in Horsfield's 'Catalogue of the India Museum' under the name of "*Golunda meltada*." When that specimen came into the British Museum and was recognized as a vole, it was determined, with some doubt, as *Arvicola mandarinus*, Milne-Edwards, by Dr. Blanford, whose determination I followed in my list of the Afghan Boundary Mammals' (1889). Renewed examination of the specimens with modern knowledge and materials shows that the species belongs to quite a different group from *M. mandarinus* and clearly needs description as new.

Its nearest geographical neighbour, *M. transcaspicus*, Satunin, is a true *Microtus*, with the fifth and sixth spaces of  $m_1$  separated, and a wholly different number of angles on  $m^3$ .

### XXXV.—On *Diapheromera femorata* (*Walking-stick Insect*). By BEATRICE O. CORFE.

THE following is a short account of the life and development of the *Diapheromera femorata*, or walking-stick insect, which I watched with great interest during the summer of 1911, keeping them in an insect-cage in a warm room near the window.

Four eggs, together with the dried female insect which laid them, were sent me from Toronto, Canada, in March 1911.



The eggs, measuring one-eighth of an inch long, are white with a dark splash of colour on one side, hard, shiny, quite opaque, and laid singly : they might easily be mistaken for seeds. At the larger end is a cap, which splits off to allow the insect to creep out.

June 5th, three hatched. The insects were half an inch long and bright green, very similar in form to the mature ones, but the bodies somewhat bent, as if they had been folded backwards and forwards in the egg. They feed on hazel-leaves, eating the edge like caterpillars, but far more moderately, being content to rest for several hours at a time without food.

The fourth egg did not hatch till July 3rd, exactly four weeks later. This was curious, as the eggs were all laid by the same insect at the same time, and were kept under exactly the same conditions. It only lived three days.

June 19th, I found a cast skin, and after that they moulted every ninth or tenth day. Three times I watched this very uncomfortable metamorphosis. Fastening its claws securely to a leaf or some projection, with its head hanging downwards, the insect proceeds to draw itself through a small aperture made by the skin opening at the back of the head, which is bent forward, the antennæ and legs all in front of the body. One after the other, legs and antennæ free themselves till it hangs only by the extremity of the abdomen. A quick bend upwards frees this and at the same time allows the insect to obtain foothold on anything near, and so prevents it falling to the ground. The old skin is left entire, a colourless tissue, in which can be traced every joint and mark. The first metamorphosis I witnessed, July 11th, lasted fifteen minutes ; the third, July 30th, forty minutes.

Should it, as is often the case, become entangled in the old skin, it can, by means of a weak point between the femur and trochanter, throw off a leg and so complete its moult. The leg will grow again, but not usually to its full length. One of my insects cast a leg in this way, but it was caught also by its antennæ, and being unable to free itself died.

Each moult made a considerable difference in size and colour, and the three developed very unequally. July 13th, after a moult, the largest measured two inches long, was a dull brown marked with spots of dark brown and green ; the others were still green, the smallest only one and a quarter inches long.

The next moult, July 21, 22, and 23 respectively, the brown one attained almost mature colour and was two inches long ; the second becoming equal in size but of a pale greenish yellow with a few small dark spots ; the third remaining quite green and much smaller.

The last moults occurred July 30th, August 1st and 2nd, and it was at this stage I lost the smaller green one, through its getting entangled.

The two left were now mature and both males. The soft skin was replaced by a hard horny one of a light brown colour, the joints darker brown, the legs green with reddish joints and feet, the thick upper part of the middle pair being ringed with brown and green. The antennæ were red and equalled the body in length, one insect measuring fully three inches, the other just over two and a half inches. The middle and shortest legs in the males have the portion between the body and the first joint thicker than the rest. The front pair, which equal the antennæ in length, are so formed as to allow them to press closely round the head and extend in front of the body with the antennæ when the insect is at rest. It is then singularly like a piece of stick, even the joints having a strong resemblance to the growth of a woody plant; but I seldom saw them in this position after they became mature. They moved about more, and when at rest were almost always close together, often resting their claws on each other, though they would move irritably if touched by any other insect. I never heard them make the slightest sound, either by day or after dark, but they had a curious caressing way of touching each other with their long fore-legs and antennæ. When one lay dying on the ground, the other stood over it for ten minutes, touching it gently in this way; but getting no response it retired to another part of the cage, returning to its dying friend, again and again, till I removed it.

They died September 16th and October 21st.

The principal difference between males and females :—

*Males.*

General form thinner, with abdominal portion slightly shorter in proportion to the thorax. Abdomen ending in claspers. Legs very long. Femur of middle pair much thickened, spines at the first joint of middle and back pair. Antennæ very long. Colour light varied with green and red.

*Females.*

General form thicker, abdomen and thorax equal in length. Abdomen ending in ventral process; no claspers. Legs much shorter, all simple with no spines. Antennæ also shorter. Colour dull and brown.

The following measurements are taken from a male and female insect, each three inches long :—

*Male.*

Legs . . . . .  $2\frac{1}{2}$ ,  $1\frac{1}{2}$ ,  $2\frac{1}{2}$  inches.  
Antennæ . . . . .  $2\frac{1}{2}$  inches.

*Female.*

Legs . . . . .  $1\frac{1}{2}$ ,  $1\frac{1}{4}$ ,  $1\frac{1}{4}$  inches.  
Antennæ . . . . .  $1\frac{1}{4}$  inches.

XXXVI.—*New African Phlebotomic Diptera in the British Museum (Natural History).* — Part VIII. Tabanidæ (continued). By ERNEST E. AUSTEN\*.

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PANGONIINÆ.

Genus DORCALEMUS, Austen.

*Dorcalemus woosnami*, sp. n.

♀.—Length (6 specimens) 12·6 to 13·75 mm.; width of head 4·25 to 4·75 mm.; width of front at vertex 0·75 mm. to just under 1 mm.; distance from anterior margin of epistoma to anterior margin of eye (measured in a direction parallel to dorsal surface of base of labrum) 1·2 to 1·25 mm.; length of proboscis (beyond anterior margin of epistoma) 3·5 to 4·8 mm.; length of wing 11 to 12 mm.; greatest width of wing 4 to 4·6 mm.

Closely allied to *D. fodiens*, Austen, but distinguishable from this species, as also from *D. compactus*, Austen, by the ochraceous† (tawny-ochraceous or tawny) area on the dorsum of the abdomen, beyond the first segment, being confined to the second segment instead of also including the third, and by the ventral surface of the third segment having a dark transverse band (usually more or less interrupted in the middle); agreeing with *D. compactus* and differing from *D. fodiens* in the absence of a tuft of black hair on the mesopleuræ.—Face short; dorsum of thorax dull olive (yellowish-olive or greyish-olive) pollinose (ground-colour black), clothed with fine, erect, silky, Naples-yellow or pale straw-yellow hair, mixed with fine black hairs; first abdominal segment orange-buff, dorsum of second segment with a median black spot, dorsum of third to sixth segments inclusive shining black except their hind borders, which are greyish pollinose and clothed with silvery-white, ochre-yellow, or orange-ochraceous hair; wings with a distinct luteous tinge, though more hyaline than in *D. compactus* or *D. fodiens*; legs as in former species, though tips of tarsi usually brown or brownish.

Head light grey pollinose; upper half of front, except very narrow margin on each side, blackish, surrounding in median

\* See Ann. & Mag. Nat. Hist. ser. 8, vol. vi. p. 337 (1910).

† For names and illustrations of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, and Company, 1886).

line a shining black more or less triangular callus, apex of which is directed upwards, while its base rests on anterior boundary of infuscated area; lower part of sides of face clove-brown, clothed, at least in part, with black hair, central portion of face thinly clothed on each side with whitish hair; jowls and basioccipital region densely clothed with shining white hair; *palpi* greyish clove-brown, proximal joint clothed below with yellowish-white hairs, and on the outer side with blackish hairs; *proboscis* relatively short—as compared with that of *D. compactus*, Austen, shorter and stouter, the labella being also shorter and more curved downwards at the tips, while the part of the labium immediately preceding them is more distinctly swollen below; first joint of *antennæ* clove-brown, greyish pollinose, the sparse hairs on it black, second joint either agreeing with first in coloration or more or less greyish ochraceous-buff or greyish fawn-coloured, third joint dusky brownish chestnut. *Thorax*: pleuræ and pectus agreeing with dorsum in coloration, and clothed with yellowish hair. *Abdomen*: dorsum of first segment greyish pollinose on an orange-buff ground, with in centre a slate-grey blotch, which, however, does not project much beyond hind margin of scutellum; hairy covering of dorsum of first segment bright orange-buff, in some specimens paler (yellowish or yellowish white) in centre and immediately on each side of middle line; dorsum of second segment ochraceous, tawny-ochraceous, or tawny, with, in middle line, a larger or smaller greyish-black spot, usually more or less triangular in shape, with its base resting on front margin and its blunt apex extending scarcely if at all beyond middle of segment; on each side of dorsum of second segment is a larger or smaller blackish blotch, of irregular shape and scarcely if at all visible from above; dorsum of second segment clothed in front with minute, appressed, black hairs, and on hind margin, on posterior angles, and on more than posterior half of each lateral third with glistening, appressed, silvery-white hair, which in centre of hind border and anteriorly is interspersed with ochreous hairs; dorsum of third segment, though normally as described in diagnosis above, sometimes showing an irregular paler (chestnut) area on each admedian fifth; hind border of dorsum of third segment clothed with appressed silvery-white (in middle line sometimes pale ochre-yellow) hairs, forming a conspicuous band across posterior third of segment, or even in some instances rather more; hind border of dorsum of fourth segment clothed partly with ochre-yellow, partly with silvery-white hairs; hind margins of dorsum of fifth and



sixth segments clothed with bright orange-ochraceous or ochre-yellow hairs, which on fifth segment, on and towards posterior angles, are sometimes mixed with or replaced by white hairs; black area of dorsum of third and three following segments clothed with minute, appressed, black hairs; dorsum of seventh segment greyish black and clothed for most part with black hairs, sometimes mixed with yellowish hairs on hind margin and replaced by ochre-yellow hairs on each side; ground-colour of ventral surface of abdomen corresponding to that of dorsum, except in case of third segment, which is as described in diagnosis; ventral scutes of second and two following segments each with a transverse band of appressed silvery-white hairs\*, which may be replaced by ochreous hairs in and adjacent to centre line; on ventral scute of second segment this band of pale hairs occupies distal two-thirds of segment, but on ventral scutes of third and fourth segments the band of pale hairs is far less deep, occupying less than, or at any rate not more than, distal half of scute in each case; ventral scutes of fifth and following segments clothed with black hair, which, however, on the hind borders is usually replaced, entirely or in part, by ochreous or whitish hair. *Wings*: veins for most part ochraceous or tawny ochraceous, appendix to base of anterior branch of third longitudinal vein showing considerable individual variation in length, even frequently varying in this respect in the two wings of the same specimen; stigma, when developed, ochre-yellow, narrow, and elongate. *Squamæ* cream-buff, porcelain-like. *Halteres*: stalks buff, brown at distal extremity on upper side; knobs yellowish cream-coloured, brownish at base. *Legs*: coxæ grey, clothed with yellowish or greyish hair; femora black and clothed with hair of same colour; tibiæ, tarsi, and extreme tips of femora cream-buff or buff, tibiæ dark brown or brownish at or close to distal extremities, last joint of all tarsi usually dark brown, at least with exception of extreme base, tips of other tarsal joints for most part brown or brownish; front and middle tibiæ clothed with short, appressed, and glistening, cream-coloured hair, hind tibiæ clothed with more outstanding and somewhat longer hair of the same colour.

\* In the case of one of the para-types of this species, the ventral scute of the third abdominal segment is entirely clothed with appressed ochre-yellow or pale yellow hair, while the ventral scutes of the second and fourth segments, with the exception of their fore borders, are similarly clothed; in this specimen, too, the hind margins of the ventral scutes of the fifth and sixth abdominal segments are clothed with orange-ochraceous hair at and near each extremity.

East Africa Protectorate: Athi Plains, alt. 5,000 ft., May, 1911 (*R. B. Woosnam*).

According to a note by the collector and donor, in whose honour the species is named, the type and para-types were "taken during the rainy season, in the Southern Game Reserve, near water and trees." One specimen was caught in the act of biting its captor.

In addition to the specimens here regarded as belonging to the typical form of this species, as described above, the National Collection possesses a ♀ from Makindu, East Africa Protectorate, 17. i. 1910 (*Dr. H. M. Aders*), which would appear to represent a variety of *D. woosnami*. In this example, which was caught on a zebra just after it had been shot, the third joint of the antennæ is much brighter in colour than in the typical form,—in fact it is orange-rufous, and therefore much as in *D. compactus*, Austen, while the dorsum of the third abdominal segment is partly tawny ochraceous instead of entirely black. On this segment the black area, indeed, consists of a median rhomboid spot, and on each side a transverse band, which is in contact with the anterior margin of the segment only at its lateral edge. The other characters, however, such as the short face and proboscis, white instead of yellowish-white hair on the jowls and basioccipital region, and the presence of a clove-brown transverse band on the ventral scute of the third abdominal segment, show that this specimen really belongs to *D. woosnami*, and prevent it from being regarded as an aberrant example of *D. compactus*. The markings on the third abdominal segment, the coloration of the hair on the jowls and basioccipital region, and the absence of a tuft of black hair on the mesopleuræ similarly distinguish the specimen from *D. fodiens*, Austen.

#### TABANINÆ.

Genus TABANUS, Linn.

*Tabanus sandersoni*, sp. n.

♂ ♀.—Length, ♂ (5 specimens) 13.4 to 14.5 mm., ♀ (4 specimens) 13.2 to 16 mm.; width of head, ♂ 4.8 to 5.5 mm., ♀ 4.75 to 5.4 mm.; width of front of ♀ at vertex 0.6 mm.; length of wing, ♂ 10.75 to 12.4 mm., ♀ 12.2 to 13.75 mm.

Medium-sized or smallish, dark brown or dark reddish-brown species, with dorsum of abdomen marked with a median series of pale triangles clothed with short white (yellowish-white or greyish-white) hair, resting on similar hind borders to segments.

—*Dorsum of thorax* dark brown in ♂, dark sepia-coloured or slate-brown in ♀, in both sexes greyish in front, where rudiments of three grey stripes are usually visible when viewed at a certain angle, elsewhere entirely unstriped; wings slightly tinged with sepia, anterior branch of third longitudinal vein angulate, and provided with a conspicuous backwardly directed appendix of varying length.

♂.—*Head*: frontal triangle dull olive brown or sepia-coloured, near its apex showing more or less distinctly a darker transverse band (part of the—in dried specimens—dark brown band crossing the eyes immediately below the large facets), face and occiput grey (former brownish grey next eyes and on greater part of median depressed area), basioccipital region, jowls, and sides of face clothed with blackish or dark brown hair; eyes with an area of large facets paler than and sharply contrasting with remainder, as usual not extending to hind border, but otherwise occupying more than upper half; palpi greyish cinnamon-coloured, clothed with black hair, shape of terminal joint roughly cylindrical-ovate or elongate-ovate, distal extremity usually pointed; first and second joints of antennæ greyish cinnamon-coloured, clothed with short black hair, third joint narrow and elongate, cinnamon-coloured or brownish cinnamon-coloured, terminal annuli sometimes darker. *Thorax*: dorsum viewed at a low angle from behind thinly greyish pollinose, clothed on greyish area in front with whitish hair, elsewhere clothed with fine, erect, clove-brown or black hair, mixed on scutellum with whitish hair; pleuræ and pectus grey, clothed partly with clove-brown or dark brown, partly with greyish hair. *Abdomen*: dorsum of first segment greyish brown, that of next three segments chestnut-brown, that of last three segments clove-brown; a median pale triangle (difficult to distinguish in rubbed specimens) on each segment from second to fifth inclusive; when abdomen is viewed from behind at a low angle, ground colour of triangles, as also that of pale hind borders to segments, appears greyish pollinose; on second and third segments triangles actually clothed with white hair, as described in diagnosis above, are often quite small, and usually do not extend forwards beyond middle of segments, if so far; on fourth and fifth segments the white-haired triangles are apparently larger, and apex of each triangle may reach hind margin of preceding segment; hind borders of fourth to sixth segments inclusive, viewed from above, dull isabella-coloured, those of second to fifth segments inclusive clothed like median triangles with short, white, yellowish white, or greyish-

white appressed hairs; hind margin of first segment fringed in centre and at each end with a row of yellowish-white hairs, elsewhere dorsum of abdomen, except as already stated, clothed with black hair; ventral surface of first four segments cinnamon, that of last three segments clove-brown, hind borders of ventral scutes of second to sixth segments inclusive cream-buff or isabella-coloured, clothed, except in case of sixth segment, with short, whitish (silvery-white or yellowish-white) hair; ventral surface of second segment clothed partly with short, appressed, whitish, partly with longer dark brown hairs; ventral surface of following three segments often clothed either entirely or for most part with short, appressed, whitish hairs. *Wings*: a faint sepiceous tinge sometimes slightly more distinct than elsewhere on costal border, beyond end of first longitudinal vein; *stigma* raw-umber-coloured, narrow and inconspicuous; veins dark brown, appendix to anterior branch of third longitudinal vein usually long and curved, occasionally differing in length in the two wings of the same specimen. *Squamæ* drab or isabella-coloured, borders sepia-coloured. *Halteres* seal-brown, bases of stalks paler (isabella-coloured). *Legs*: coxæ grey, clothed with blackish-brown or brownish hair, sometimes mixed with whitish hair, hind coxæ sometimes entirely clothed with whitish hair; femora clove-brown, greyish at base posteriorly, clothed with black hair (middle and hind pair towards base with whitish hair); front tibiæ burnt-umber-coloured, dark brown towards tips; middle and hind tibiæ burnt-umber-coloured, hind tibiæ shortly fringed on inner and outer sides with fine blackish hair; front tarsi clove-brown, second and two following joints somewhat expanded; middle and hind tarsi dark mummy-brown, first joint burnt-umber-coloured towards base.

♀.—*Head* brownish grey (occiput light grey), face clothed mainly with brownish or blackish hair, jowls and basioccipital region with greyish hair; *front* rather narrow (its length, as estimated by eye, more than eight times greater than its breadth at the lower extremity), inner margins of eyes bordering it converging slightly below, region adjacent to vertex clothed with short black hair and usually darker than elsewhere; *frontal callus* dark brown or dark mummy-brown, elongate, elliptical in outline, its upper extremity produced into a similarly coloured, lanceolate or acicular, median ridge; proximal joint and base and inner surface of terminal joint of *palpi* greyish fawn-coloured, outer surface of distal three-fourths of terminal joint slate-grey and clothed mainly with short black hairs, proximal



joint and under surface of base of terminal joint clothed with longer yellowish hairs, outer surface of base of terminal joint clothed with shorter glistening yellowish or whitish hairs mixed with some black hairs, distal extremity of terminal joint bluntly pointed; *antennæ*, except for their larger size and the greater breadth of the expanded portion of the third joint, resembling those of ♂. *Thorax*: dorsum clothed with short, erect, black hairs, which on scutellum and on greyish area in front are replaced by glistening greyish-white hairs; hairs of latter kind are also largely present on postalar calli and on region immediately in front of these, and are interspersed with the black hairs on the sides and anterior portion of the dorsum, and also immediately in front of scutellum; pleuræ and pectus grey, and clothed partly with grey, partly with dark brown or brownish hair. *Abdomen*: dorsum agreeing with that of ♂, as described above, except that the triangles on third, fourth, and fifth segments are larger and broader and the hind borders of these segments deeper, especially at each lateral extremity, where they are expanded and curve forward so much as almost to reach posterior angles of preceding segment; the pale hairs on the dorsum are also shorter and somewhat less fine than in ♂, and are set more closely together; ventral surface of first four segments greyish cinnamon-rufous, that of fifth segment (except hind margin) more or less dark brown or brownish, ventral surface of first five segments clothed with short, appressed, glistening whitish hairs, hind margins of ventral scutes of second to fifth segments inclusive cream-buff; ventral scutes of last two segments clove-brown, clothed with similarly coloured or blackish hair, hind border of penultimate segment isabella-coloured. *Wings* as in ♂; sepiaceous tinge next distal extremity of costa, about tips of second longitudinal and anterior branch of third longitudinal veins, usually distinct. *Squamæ* and *halteres* as in ♂. *Legs* as in ♂, except that tibiae are clothed with short, appressed, whitish hairs; hind tibiae, especially on outer side, with a short fringe of somewhat longer whitish hairs; second, third, and fourth joints of front tarsi expanded.

Nyasaland Protectorate and North-Western Rhodesia: type of male, three other males, and one female (para-types) from the Kasinga Stream, Central Angoniland, Nyasaland Protectorate, alt. 1,760 to 2,500 ft., 21, 25. i. 1911 (*Dr. Meredith Sanderson*: presented by the Entomological Research Committee); type of female from Kasempa District, N.-W. Rhodesia, between 3,500 and 4,500 ft., 1903 or 1909 (*E. A.*

(Copeman) ; additional specimens (para-types—presented by the Entomological Research Committee) as follows :—one male from the Chitala Stream, Central Angoniland, Nyasaland Protectorate, alt. 1,760 ft., 18. i. 1911 (Dr. M. Sanderson) ; two females from the Ruvo Valley, near Chiromo, Nyasaland Protectorate, April, 1910 (S. A. Neave).

Writing from the Dowa District, Nyasaland Protectorate, in February, 1911, Dr. Meredith Sanderson, in whose honour the species has been named, kindly supplied the following field-note with reference to *Tabanus sandersoni* :—“ Found in marshy ground, sandy plains, and hills, but always where there are trees or bush. Enters villages and houses ; does not bite immediately on settling, and may move about before biting. In the act of sucking blood the abdomen is elevated and the head lowered. Difficult to catch with the hand.”

So far as it is possible to judge from the material available for comparison, *Tabanus sandersoni* is perhaps allied to *T. quadriguttatus*, Ricardo, more nearly than to any other species of *Tabanus* yet described. *Tabanus quadriguttatus*, which is at present known only from German East Africa, exhibits, in the female sex at any rate, a decided resemblance to *T. sandersoni* in the coloration and markings of the dorsum of the abdomen, as also in the width of the front, and in the shape &c. of the frontal callus and its upward extension. Apart from other characters, however, the female of *T. quadriguttatus* differs from that of the new species in its much larger size, in the more slender shape and different coloration of the terminal joint of the palpi (the outer surface of which is uniformly dark slate-coloured, and apparently clothed exclusively with minute black hairs), in the presence of a border of ochre-yellow hair on each side of the dorsum of the thorax, in the ground-colour of the ventral surface of the abdomen (except the hind margins of certain segments) being entirely black, in the veins in the distal half of the wings being strongly suffused with mummy-brown, in the stigma being large, burnt-umber-coloured, and very conspicuous, and in the anterior branch of the third longitudinal vein not being angulate at the base nor provided with an appendix.

*Tabanus simpsoni*, sp. n.

♀.—Length (1 specimen) 15·6 mm. ; width of head 5·6 mm. ; width of front at vertex 0·75 mm. ; length of wing 14·4 mm.

*In general appearance resembling T. kingsleyi, Ricardo.*—*Front* moderately broad, scarcely (if at all) narrower below; expanded portion of third joint of antennæ orange-rufous, terminal annuli clove-brown or dark brown; *dorsum of thorax* (except scutellum) cream-buff, marked with three sharply defined clove-brown longitudinal stripes; *dorsum of abdomen* ochraceous-buff, with a conspicuous and sharply defined cream-buff median longitudinal stripe of nearly uniform width, and distal extremity and a pair of admedian stripes clove-brown; *wings* (except costal cells and stigma) nearly hyaline, though faintly tinged with drab; *legs* (except coxæ, tarsi, and tips of front tibiae) cinnamon-coloured.

*Head*: front cream-buff, slightly darker on vertex, clothed with short ochreous hairs and about four and a half times as long as its width at the lower extremity; subcallus greyish cream-coloured; face, jaws, and basioccipital region light grey, clothed with white hair; occiput smoke-grey, posterior orbits light grey; *frontal callus* dark brown, shining, not in contact with eyes, roughly oblong in shape (nearly twice as long as broad and rather narrower at its upper extremity) and with its upper margin somewhat irregular and indistinctly connected with a short, median, clove-brown, linear or lanceolate extension, which occupies centre of front; proximal joint of *palpi* cream-buff and clothed with white hair, terminal joint cream-coloured, long and narrow (moderately swollen a little beyond base), clothed on outer side with minute, appressed, whitish or yellowish-white hairs: *antennæ* (at least third joint) relatively rather large, first and second joints greyish ochraceous-buff, upper distal angle of second joint not noticeably produced, third joint long, its expanded portion moderately broad and with a fairly prominent angle on its upper margin at end of proximal third, terminal annuli (at least the three proximal ones) large. *Thorax*: anterior extremity of *dorsum* olive-grey, cream-buff longitudinal dorsal stripe on each side of clove-brown median stripe rather broad, extending from olive-grey anterior border to hind margin, of absolutely uniform width throughout, and clothed with short Naples-yellow hair; clove-brown dorsal stripes clothed with black hair and about half as broad again as admedian cream-buff stripes, each outer clove-brown stripe diminishing in width in front of transverse suture; sides of *dorsum* clothed with yellowish hair, a fringe of black hair extending from base of each wing to front margin; *pleuræ* and *pectus* light grey, clothed with greyish-white hair; *dorsum of scutellum* grey and clothed with short, appressed, Naples-yellow hairs,

except a dark median stripe (a prolongation of the clove-brown median stripe on the main portion of the thorax) which is clothed with black hairs. *Abdomen*: cream-buff median dorsal stripe of about same width as admedian cream-buff stripes on dorsum of thorax and therefore relatively rather broad (slightly narrower than elsewhere on sixth segment and towards hind margin of fifth), clothed with short, appressed, Naples-yellow hair, and terminating abruptly on hind margin of sixth segment; clove-brown, admedian, dorsal stripes of nearly same width as median stripe, pale on first segment and interrupted on base of second, then becoming darker; dorsum of sixth and seventh segments, except lateral margins (and also median stripe in case of former segment), clove-brown, dorsum of fifth segment also with an ill-defined clove-brown longitudinal mark next lateral border, connected along hind margin with admedian stripe and anteriorly extending on to hind border of fourth segment; proximal dorsal angles of first segment greyish pollinose; ochraceous-buff area of dorsum of abdomen clothed with short, appressed, ochre-yellow hairs, posterior angles and extreme lateral margins of segments clothed with paler hairs; on first four segments, between admedian stripe and lateral border on each side, are traces of a faint and ill-defined dusky longitudinal stripe, connected with corresponding mark on fifth segment already described, and clothed, at least in part, with minute black hairs; the ochraceous-buff area between the admedian stripes and the ill-defined dusky longitudinal stripes just mentioned is light greyish pollinose (most noticeable when abdomen is viewed at a low angle from behind); venter ochraceous-buff and clothed with short, appressed, pale yellowish hairs, terminal segment slate-coloured and clothed, as usual, with coarse, erect, black hairs, penultimate segment slate-grey and clothed partly with black hairs, antepenultimate segment greyish. *Wings*: costal cells raw-umber-coloured; *stigma* mummy-brown, elongate and conspicuous; costa dark brown, other veins lighter or darker mummy-brown. *Squamæ* isabella-coloured, borders cream-buff. *Halteres*: stalks ochraceous-buff, knobs cream-coloured, buff at base. *Legs*: coxæ light drab-grey or smoke-grey, clothed with greyish-white hair; femora and tibiae clothed for most part with short, appressed, glistening, ochreous or pale yellowish hair, posterior surface of middle femora clothed except at base with longer yellowish-white hair; inner surface of front femora cinnamon-rufous, except at base, where it is dark brown; base of middle and hind femora and of outer surface



of front femora more or less grey: tips of front tibiæ, especially on inside, where they are clothed with short, appressed, black hair, dark brown; front tarsi clove-brown, not conspicuously expanded, middle and hind tarsi dark brown, first joints except distal extremities brownish cinnamon-rufous.

Northern Nigeria: Ossa, 27. ix. 1910 (*J. J. Simpson*: presented by the Entomological Research Committee).

Although in general appearance *Tabanus simpsoni* presents a closer resemblance to *T. Kingsleyi*, Ricardo (which belongs to Surcouf's "Ninth Group" of the genus *Tabanus*\*), than to any other of its congeners at present known, the affinities of this handsome new species, with which the author has much pleasure in connecting the name of its discoverer, are in reality with Surcouf's "Eighth Group," which includes *Tabanus taniola*, Pal. de Beauv., *T. distinctus*, Ricardo, and allied species. From all of these, however, the new species is distinguishable at once by its very conspicuous and sharply defined body-markings, as described above. From *T. kingsleyi*, Ricardo, *T. simpsoni* can be distinguished by, *inter alia*, the greater breadth of the front and of the median stripe on the abdomen, by the inner margins of the eyes bordering the front being parallel or practically so, instead of converging below, by the sharper definition of the cream-buff, admedian, thoracic stripes, by the terminal joint of the palpi being cream-coloured and clothed with whitish or yellowish-whitish hairs, instead of isabella-coloured and clothed mainly with black hairs, and by the pale legs and more hyaline wings.

Besides occurring in Northern Nigeria, *Tabanus simpsoni* is also found in the Gold Coast Colony: since the above description was drawn up, the National Collection has received a second female of this species, caught in the Hospital at Salaga, Northern Territories, Gold Coast, on July 5, 1910 (taken and presented by Dr. F. J. A. Beringer, W.A.M.S.).

*Tabanus besti*, Surcouf, var. *arbucklei*, var. n.

♀.—Length (7 specimens) 14 to 18.2 mm.; width of head 4.5 to 5.6 mm.; width of front at vertex rather less than 0.5 to 0.5 mm.; length of wing 11 to 13.2 mm.

Differing from the typical form of the species in the third joint of the antennæ being narrower, and in the paler portion (rather more than the proximal half) of the front tibiæ being

\* Cf. J. M. R. Surcouf, 'Étude Monographique des Tabanides d'Afrique,' p. 16 (1909).

*cinnamon-rufous and clothed with similarly coloured hair, instead of cream-coloured and clothed with yellowish-white hair.*—*Clove-brown, entirely devoid of markings; wings dark sepia (second basal, anal, and axillary cells, alula, and greater part of second submarginal cell paler); middle and hind tibiæ entirely cinnamon-rufous.*

*Head* greyish clove-brown, face, jowls, and basioccipital region clothed with clove-brown hair; *front* long and very narrow, diminishing slightly in width towards the lower extremity, and clothed above callus with short blackish hairs; *frontal callus* dark mummy-brown or dark sepia, narrow and elongate, its upper extremity produced into a clove-brown median ridge, which gradually tapers away, and eventually disappears at a distance from the posterior margin of the vertex equal to about one-fourth of the total length of the front; *subcallus* protuberant, denuded and shining, agreeing with callus in colour; *palpi* clove-brown, proximal joint clothed with clove-brown hair, terminal joint long, of moderate width at base, bent and tapering gradually to a point, clothed on outer side with minute black hairs; first joint of *antennæ* greyish burnt-sienna-coloured, clothed above with minute black hairs, second joint cinnamon-rufous, clothed with minute black hairs and with its upper distal angle much produced, expanded portion of third joint cinnamon-rufous, brown or brownish towards distal extremity, narrow and elongate, its upper margin at a point from one-fourth to one-third of its length from base excavated so as to form a hook-like, forwardly-directed angle, lower margin bluntly angulate shortly before middle, terminal annuli clove-brown, short. *Thorax*: dorsum somewhat greyish, clothed with minute dusky ochreous hairs, mixed with short black hair, pleuræ and pectus slate-grey, clothed with black hair. *Abdomen* clothed above and below with minute black hairs, hind margins of ventral scutes of second, third, and fourth segments, and frequently also posterior angles of dorsal scutes of first and second segments, clothed with bright ochre-yellow hairs; dorsum of first segment, when abdomen is viewed from behind, appearing greyish on each side. *Wings*: veins dark brown (costa and first longitudinal vein clove-brown); *stigma* elongate, dark mummy-brown. *Squammæ* clove-brown. *Halteres* dark sepia, distal halves of knobs cream-buff. *Legs*: coxæ slate-grey, clothed with clove-brown or blackish hair; femora black or clove-brown, clothed with black hair, tips of middle and hind pairs cinnamon-rufous; distal extremities of front tibiæ clove-brown or dark brown; front tarsi black, not

conspicuously expanded, middle and hind tarsi dark brown, first joints more or less cinnamon-rufous, at least at base, hind tarsi occasionally entirely cinnamon-rufous, or at least tips of joints alone dark brown or brownish.

Sierra Leone; Sierra Leone Protectorate; Liberia; Gold Coast.

Type and twelve other specimens of the variety from Bo, Sierra Leone Protectorate, 1, 8, 9, 19. x. 1909 (*Dr. H. E. Arbuckle, W.A.M.S.*). The following are the data with reference to the other examples of this variety at present contained in the National Collection:—SIERRA LEONE: 2 specimens, Sherbro I., January 1909 (*Dr. C. B. Hunter, W.A.M.S.*); 1 specimen, Hill Station, Freetown, November 1909 (*Major A. Pearse, R.A.M.C.*). SIERRA LEONE PROTECTORATE: 1 specimen, Port Lokkoh Creek, April 1904 (*Major F. Smith, D.S.O., R.A.M.C.*); 8 specimens, Karina District, October–November 1906 (*Dr. H. E. Arbuckle*); 17 specimens, Tiama, 9. ix., Yonibanna, 30. x., Makobo, 11. xi., Kogbutoma, 18. xi., Tembahun, 19. xi., Ebambatuck, 20. xi., Matassu, 22. xi., Benduma, 23. xi., Mossellulu, 30. xi. 1909, Matotoka, 26. i., Makonou, 27. i., and Maboou, 28. i. 1910—all localities in Ronietta District (*Dr. J. J. Moore, W.A.M.S.*); 2 specimens, Batkanu, Karina District, December 1909 (*Dr. J. C. Murphy, W.A.M.S.*); 1 specimen, Kennema, March 1910 (*Dr. H. E. Arbuckle, W.A.M.S.*). LIBERIA: 1 specimen, Gis-i, 27. iv. 1909 (*Major A. Pearse, R.A.M.C.*). GOLD COAST: 1 specimen, Wassau Territory, 1901 (*Dr. S. H. Jones*).

*Intermediate form between Tabanus besti, var. arbucklei, Austen, and T. besti, Surcouf (syn. T. obscurissimus, Ricardo).*—In addition to the foregoing specimens, which clearly belong to the var. *arbucklei*, as described above, the British Museum (Natural History) also possesses eight ♀♀ of *T. besti*, which may be regarded as representing a form intermediate between the var. *arbucklei* and normal *T. besti*. As compared with the var. *arbucklei*, this form is distinguished by the subcallus being if anything less prominent and always dull (clothed with brownish pollen, as in the typical race of the species), by the expanded region of the third joint of the antennæ being usually broader, and by the proximal portion of the front tibiæ, although cinnamon-rufous, being clothed with hair which is whitish or yellowish instead of the same hue as the ground-colour. The details as to localities, dates of capture, &c., of these eight specimens are as follows:—SIERRA LEONE PROTECTORATE: 3 specimens, Kennema, April–May 1910 (*Dr. H. E. Arbuckle, W.A.M.S.*);

2 specimens, Daru, 6. vi. 1911 (*Dr. J. C. Murphy, W.A.M.S.*).  
 LIBERIA: 2 specimens, Tappoima, 8. v. 1909 (*Major A. Pearse, R.A.M.C.*). GOLD COAST: 1 specimen, Huyi Valley, Ashanti, 1. v. 1908, "caught in station, Gold Coast Government Railway, 11.0 P.M." (*Dr. W. M. Graham, W.A.M.S.*).

### Genus *HÆMATOPOTA*, Meigen.

#### *Hæmatopota tumidicornis*, sp. n.

♀.—Length (5 specimens) 9 to 10 mm.; width of head 3 to 3.25 mm.; width of front at vertex 1.25 to 1.4 mm.; length of wing 8 to 8.5 mm.

*Dusky (clove-brown) species, with strongly swollen first antennal joint, two longitudinal rows of conspicuous, rounded, smoke-grey or yellowish-grey spots on dorsum of abdomen, and drab-coloured wings, in which the stigma usually stands out conspicuously.*

*Head*: front fairly broad, mouse-grey narrowly edged with light grey, frontal spots black, median spot inconspicuous, sometimes very small, lateral frontal spots variable in size, occasionally small and not connected with eyes, but usually large or fairly large, more or less triangular in outline and in contact with eye on each side; *frontal callus* clove-brown, of moderate depth, sparsely clothed at each extremity with pale yellowish hairs, which in preserved specimens are often wanting, its upper margin straight or nearly so; face and jowls light grey, clothed with pale yellowish hair, upper part of face on each side between eye and base of antenna with a dark brown band, which is clothed with blackish hair, and when viewed from certain angles appears more or less broken up into dots; *palpi* dusky grey, terminal joint not much or usually only moderately thickened towards base, and clothed on outer side with blackish mixed with yellowish hair; *antennæ* black (second joint and expanded portion of third really clove-brown), first joint shining black, very slightly greyish pollinose, clothed with black mixed on outer side with pale (whitish or yellowish) hair, first joint viewed from above or from side truncate elliptical-ovate in outline, its lower surface near distal extremity sometimes slightly flattened, upper angle of second joint only moderately produced, expanded portion of third joint near base, viewed from side, less than twice as deep as terminal annuli, which are usually of considerable relative depth. *Thorax*: dorsum, including scutellum, sparsely clothed with minute, shining, pale ochre-



yellow hairs; dorsum marked with three narrow, drab-grey or smoke-grey, longitudinal stripes, which in rubbed specimens are more or less indistinct except in front of the transverse suture, the median stripe in some cases very slender and much narrower than the paired stripes, the latter (sometimes also the median stripe) expanded on the front margin; continuation of each paired stripe marked by a spot behind transverse suture; the usual crescentic marks in front of presutural groove difficult to distinguish in rubbed specimens; pleurae, pectus, and a longitudinal stripe on each side of dorsum behind transverse suture grey, pleurae clothed partly with whitish or greyish, partly with dark brownish hair. *Abdomen*: dorsum clothed with minute, appressed, pale yellowish or pale ochre-yellow hairs, second and following segments each with a pair of rounded spots, as described in diagnosis, spots on second and third segments not in contact with front or hind margins, those on following segments in contact with front margin in each case, spots on seventh segment much smaller than remainder, which are usually relatively large, lateral extremities of dorsal scutes of all segments more or less grey, though the grey lateral extremities are palest and most distinct in the case of the first three segments, extreme hind margins of all segments narrowly yellowish grey; venter smoke grey, with a broad, median, clove-brown, longitudinal stripe; hairy covering of venter similar to that of dorsum. *Wings* drab or brownish drab, distinctly marked with the usual three rosettes and other pale markings, but with the *first basal cell* and also the *first posterior cell except its distal extremity semi-hyaline* and *usually entirely devoid of markings*, though the outlines of the portions of the rosettes falling within these cells are sometimes faintly discernible; first and second costal cells very lightly tinged with drab; portion of marginal cell on proximal side of stigma and anal cell as far as proximal rosette semi-hyaline and devoid of markings; sinuous pale mark at tip of wing clearly defined, running from costa, immediately beyond distal extremity of second longitudinal vein, to posterior branch of third vein, broadening out at its anterior extremity and sometimes sending out an offshoot in the shape of a streak running along the costa towards the stigma; in some specimens the apical sinuous mark is converted into an elongate loop by an additional mark beyond it, more irregular and less sharply defined, connecting its extremities; upper portion of distal rosette clearly defined, consisting of a single streak which is usually widely interrupted on the second longitudinal vein, so that the upper

extremity of the rosette forms the customary loop in the marginal cell immediately beyond the stigma; lower portions of proximal and median rosettes alone distinct; proximal and distal extremities of discal cell more or less distinctly occupied by portions of these rosettes; second basal cell with a more or less distinct pale loop at each end, the proximal loop, however, sometimes taking the form of an ill-defined pale blotch; posterior cells crossed by a series of disconnected, oblique, pale marks (the usual continuation of the apical sinuous mark); along posterior margin of wing light markings usually but not invariably present in distal angles of posterior cells; anal angle with a more or less distinct pale border (sometimes broad), proximal extremity of which is connected with usual loop in angle formed by axillary incision and sixth longitudinal vein, while to distal extremity is attached customary zigzag mark, which crosses anal cell (in some specimens pale border of anal angle is continued along hind margin to distal extremity of axillary cell); veins for most part mummy-brown; membrane immediately adjoining base of anterior branch of first longitudinal vein and that bordering veins or portions of veins bounding distal extremity of discal cell and posterior half of distal extremity of second basal cell *distinctly infuscated*; *stigma* usually dark brown or clove-brown and sharply defined (except its proximal extremity, which is somewhat paler); quadrate drab-coloured patch behind stigma (crossing marginal and first submarginal cells) inconspicuous. *Halteres*: knobs dark seal-brown, stalks cream-coloured. *Legs*: coxæ and femora slate-grey, sparsely clothed with fine yellowish hair; front tibiæ clove-brown, marked just beyond base with a fairly broad buff-coloured or cream-buff band, distal two-thirds conspicuously swollen; middle and hind tibiæ dark brown, each marked with two buff or cream-buff bands; tarsi clove-brown, first joints of middle and hind pairs, except distal extremities, cream-buff.

East Africa Protectorate: type and five other specimens from the Athi Plains Game Reserve, alt. 5,000 ft., May 1911 (*R. B. Woosnam*).

The species above described is not closely allied to any of its Ethiopian congeners hitherto discovered, from which the shining black coloration and elliptical-ovate outline of the first joint of the antennæ will at once serve to distinguish it. As regards the shape of the antennæ, the nearest approach to the present species among Ethiopian forms is perhaps made by *Hematopota inflaticornis*, Austen, which is as yet known only from Angola; in *H. inflaticornis*,

however, the first joint of the antennæ, though strongly swollen, is less elliptical in outline and more densely greyish pollinose, while, *inter alia*, the alarominal markings are very different from those of *H. tumidicornis* and the front tibiae are more slender. As regards the wings, the absence or almost total absence of markings and coloration in the first basal cell and in the first posterior cell with the exception of its distal extremity is highly characteristic, and gives the wings when seen against a dark background a *longitudinally streaked* appearance, reminiscent of that presented by the wings of *H. copemani*, Austen, and certain of its allies; with the group represented by *H. copemani*, however, the present species has nothing beyond generic characters in common.

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XXXVII.—On the Boring Mollusca of St. Andrews.

By B. LINDSAY, Gatty Marine Laboratory, St. Andrews.

[Plate VIII.]

PROFESSOR MCINTOSH, of St. Andrews, has always maintained that the main work of marine boring organisms is accomplished by mechanical means, and not necessarily by the aid of an acid secretion. The latter theory, however, has been advocated within comparatively recent years, and Professor McIntosh therefore requested me to make some fresh observations on the subject. No traces of acid secretion were found; but the details of mechanical boring, on the contrary, were observed, and the descriptions of it given by previous writers were confirmed and extended.

St. Andrews offers a good field for the study of this subject in its most important aspect—namely, in connection with coast erosion, which is undoubtedly much assisted by the work of marine borers. The types studied were *Zirphea* (*Pholas*) *crispata*, *Saxicava rugosa*, and *Tapes pullastra*.

Of the Boring Mollusca of St. Andrews, *Zirphea* (*Pholas*) *crispata* is far the most important in numbers and in activity. It removes vast quantities of shale and no inconsiderable amount of sandstone, and is undoubtedly a most important factor in the process of coast erosion.

At the East Rocks the boring-grounds of *Zirphea* are two, and each is associated with serious encroachment of the sea. One is situated below a spur of rock which protects the bay

on the east side—that is, on the side looking towards the open sea. The material removed is chiefly shale, but the sand-stone (calciferous sandstone of Geikie) is also attacked, and the gradual removal of this bulwark admits the force of the sea to the middle of the bay, where much destruction of the cliff-line has taken place within recent years, both immediately in front of the Gatty Marine Laboratory and all along the bay. There is urgent need for a small break-water, to replace the protecting rock which is being destroyed.

Another boring-ground is situated at the opposite side of the bay, in the rocks near the Beacon, at the end of the pier. The burrows are found in both shale and sandstone, and there are places in which the animals appear to have begun to work upon sandstone and to have made their way downwards into an underlying bed of shale. It is noteworthy that this boring-ground is washed by fresh water, for the stream which runs into the sea from St. Andrews harbour passes over the eastern border of these rocks. Great denudation has probably taken place here within the historic period; for there is no reason to doubt the truth of the local tradition, which states that the earliest church in St. Andrews was built here, on land now washed away. Here, again, the boring-ground lies to the eastward side of the place of sea-encroachment. Only the upper border of the boring-grounds is accessible, and that only at the lowest tides. Most of the destructive work accomplished by the Pholadide borers takes place below the littoral zone; unseen, and, by the ordinary observer, unsuspected.

On the West Sands, and at the mouth of the Eden, *Zirphæa* attains a larger size and possesses fewer and weaker ridges—a condition implying that it bores in softer material, probably mud and sand. The animals are rarely seen alive, but many shells are washed up after a storm.

*Barnea* (*Pholas*) *candida* occurs similarly on the West Sands, and is found occasionally in the rocks below the Castle. Comparatively rare at St. Andrews, it is of little local importance as an agent in the destruction of rocks. During blasting-operations in 1896, however, many specimens were thrown up on the beach, a fact recorded by Professor McIntosh in the 'Zoologist' for February 1908.

*Tapes pullastra*, which frequently inhabits the old burrows of *Zirphæa*, has sometimes been mistaken for a borer. My observations confirm the statement of Gwyn Jeffreys, that the shells are frequently distorted by having been confined in a burrow. This is a sufficient proof that the animals



cannot bore, or even enlarge an existing burrow to any appreciable extent, though they may in some degree deface its walls by friction. The creature is very active in its movements, and is probably able to move to a new habitation when it needs a larger one. Its presence in a burrow is comparatively exceptional; many specimens are found free. I suspect that the distorted shells belong to specimens which have passed the winter in shelter, and having grown a little during that period, have not been able to get out again. The shell gives the calcite reaction with Meigen's wet test.

*Succinea rugosa* also utilizes old burrows of *Zirphæa*, but it is quite able to make a burrow for itself, and is often found burrowing in sandstone. If disturbed in its hole its shell may be heard grinding as it draws itself further in. It attaches itself by suction, when frightened, and cannot be removed with the finger, even when a byssus is not present. Its boring movements do not seem to be definite in direction and purpose, like those of *Zirphæa*. Many of the burrows are parallel to the surface of the stone, so that the animal lies on its side; this fact indicates that the creature is comparatively little specialized as a borer.

The *Zirphæa* may perhaps claim to be the most highly specialized of the Pholadide borers. Its method of working is double: it sucks and scrapes; it might be described as a combination of a nutmeg-grater and a vacuum-cleaner. The following are the successive steps by which the animal prepares itself to bore:—

(1) The foot is extruded.

(2) A wide gap appears between the foot and the mantle. This gap is not, to any great extent, due to the fact that the width of the foot is somewhat decreased as it is pushed out. For a long time I could not make out the meaning of this movement, which precedes the extrusion of the mantle. It is that the animal is inflating itself, and becomes wider, so that the mantle and shell-valves are carried outward away from the foot. This is the aspect of things as seen in looking at the pedal end, while at the margin of the shell it is seen that the valves are beginning to gape a little more.

(3) The mantle becomes fully extruded. Extended far up on the upper border of the shell it forms, with the border of the dorsal shield and the accessory pieces of the shell, a dorsal plugging of the hole, while on the lower side, just opposite, it is firmly pushed out to form a ventral plug. The site of the latter is indicated by that curious narrow border between the pedal area and the siphonal area of the shell,

in which the ridges usually alternate with those of the former.

(4) After this, those rotatory movements begin which have been so often described. So far as I have observed, the earlier writers are correct in stating that the rotatory movements are in the direction of the movement of the hands of a watch, *i. e.* from right to left, the animal being in its usual position, siphons up and pedal end down.

The shell-scraping activity of the mollusk was, on one occasion, made audible—when, the wall of a burrow in shale having been partly destroyed, the animal came into contact with the concrete floor of the tank. The sound continued for hours, on several successive days, and much resembled the gnawing of a mouse in wood. Probably the rotatory shell-scraping movements might be rendered audible at any time, by the use of the microphone.

The boring powers of *Zirphæa* are materially assisted by

### *The Chemical Composition of the Shell.*

The earlier observers established the fact that these shells consist of aragonite, which, being harder than the usual calcite, better enables them to bore. This alone should almost have sufficed to establish the truth of the mechanical theory of boring.

In recent years Meigen's wet test (cobaltic nitrate) has afforded a convenient means of confirming the evidence given by optical appearances regarding the composition of the shell.

In view of the fact that in some mollusks the shell has been described as consisting of alternate layers of aragonite and calcite, it is interesting to note the deceptive appearances presented by the shell of *Zirphæa* under both tests.

(1) Optical. Owing to the fact that the upstanding ridges are set nearly at right angles to the rest of the shell, they appear, in a section examined by polarized light, as black stripes, when the plain part of the shell is illuminated.

(2) In the wet test, the ridges, when viewed externally, present streaks of lilac colour instead of the cherry-red coloration characteristic of aragonite. The reason is, that some of the substance of the surface of the ridge passes into solution in the sea-water (or in aqueous spirit, if preserved specimens are used) and is redeposited on the drying shell; it is then aragonite no longer, and gives the calcite test. On breaking the shell across and testing again, it is seen that the ridges are of the same substance as the rest; it is

only a minute quantity of fine debris lodged under the ridges which gives the lilac coloration.

The sensory powers of *Zirphæa* are worthy of note.

The animal is sensitive to vibration, but does not appear to be aware of sounds other than those that shake the water in the tank. Tapping, singing, and shouting are noticed; they are, however, not noticed immediately, but after a short interval, sufficient to allow the disturbance to travel through the water. The power of noticing vibrations is probably helpful to the animal in boring, as a means of distinguishing the direction in which lies solid and unshaken rock.

With regard to its sight, prolonged and repeated experiments have convinced me that the animal possesses a share of that faculty. A lighted match, brought within a foot of the tank-wall in the dark, causes it to start violently and then retreat instantly. Very different is its behaviour in daylight towards an opaque object, such as a pencil brought between it and the daylight and extended into the water. There is sometimes a slight initial start; but presently the siphons bend so as to approach the object, evidently in search of particles suitable for food. The shadow of the pencil is also noticed when the pencil lies outside the water, but not so readily. Many hours, on many different days, were spent in confirming these experiments, which were repeated, with fresh specimens, in three successive seasons.

The sensitive and highly pigmented ends of the siphons appear to form a pair of dark chambers, within which optical impressions are received, through apertures which are perfectly round. This sight faculty in the siphon-ends is eminently adapted to an animal which lives in a hole, with only the siphons protruding. *Barnea* (*Pholas*) *candida* is almost equally sensitive to light. Comparison was made with *Lutraria elliptica*, which possesses siphons richly fringed with cirri; but here no such sensory faculty was found in the siphons.

The larval development I have as yet not been able to trace beyond the very early stages, shortly subsequent to the formation of the blastopore; but I hope to return to that subject on a future occasion.

#### EXPLANATION OF PLATE VIII.

A & B. *Zirphæa* (*Pholas*) *crispata*, pier rocks, St. Andrews. Specimens from the sandstone rock, to show the effects of friction during boring. The shells show worn places near the pedal end, where

- the ridges are quite worn away by continuous scraping against the rock during the action of boring. A, pedal view; B, side view.
- C. Shell similarly but more uniformly worn, from the sandstone at the east side of East Bay, St. Andrews.
- D. Unworn shell for comparison. This specimen being found in shale, a material much softer than sandstone, was but little worn. Removed from its burrow and kept loose in a tank for nearly three months, the margin, unworn by boring, was found to be perfectly sharp.

## BIBLIOGRAPHICAL NOTICES.

*A Guide to the Fossil Invertebrate Animals in the Department of Geology and Palæontology of the British Museum (Natural History).* 1911. (Second Edition.) Price 1s. London: The Trustees of the British Museum.

ALTHOUGH, as is set forth in the Preface, "this book does not profess to be a complete systematic treatise, but relates only to the specimens actually exhibited in the Galleries," it is nevertheless to be regarded as the most complete work on this subject, in a condensed form, which has yet been published. This is no reflection on the numerous other Guides published by the Museum on other groups of the Animal Kingdom. They are all marvels of their kind, whether looked at from the point of view of the text or from that of the illustrations, which are excellent and liberally distributed. It is a pity that it is not more generally realized that these books are no mere "Guides," but rather expert summaries of existing knowledge profusely illustrated by Museum specimens. Such volumes would be found of the highest value even to those who do not visit the Museum from one year's end to another.

The volume now under discussion was written by Dr. F. A. Bather, the Assistant Keeper of the Geological Department: and herein we have a guarantee of its quality, for Dr. Bather is one of the most exacting of men where his own work is concerned, and possesses besides an encyclopædic knowledge of his subject, won by years of laborious study. Among zoologists to-day there are some who take a very serious view indeed of the old question "*Dans un nom qu'y a-t-il?*" To them it is much more important than the thing named. Dr. Bather is not one of these, and he has enabled those who have a mind to know what this pother of names is about by citing the case of a trilobite which was christened nearly a century and a half ago. Those, however, who are interested in zoology and who wish to have a handy and reliable epitome of our knowledge of extinct Invertebrates will find this work indispensable.



The wealth and beauty of the illustrations in this book are not the least of its remarkable features, and when so much is given it seems ungrateful to ask for more; yet in another edition we should be glad to see a figure of *Hippurites*.

*The Importation into the United States of the Parasites of the Gypsy Moth and the Brown-tail Moth.* By L. O. HOWARD and W. F. FISKE. U.S. Department of Agriculture. Bureau of Entomology. Bull. no. 91. 1911. Pp. 311.

Those who are interested in the problems of economic entomology will be well aware of the ravages caused by the abnormal increase of the Brown-tailed Moth (*Euproctis chrysorrhæa*) and the Gypsy Moth (*Porthetria dispar*) in Europe and Japan. Such students will welcome the extraordinarily thorough report now issued by the American Department of Agriculture, embodying the results of the strenuous efforts which are being made to cope with the even more serious ravages of these insects in parts of the United States, whither by accident they were introduced some years ago. The immigrants, freed from their natural foes, proceeded to increase and multiply until they have become a serious menace to the land of their adoption.

No sooner were the facts of the case fully realized, however, than the Department of Agriculture took prompt steps to cope with the trouble; and the thoroughness of their plan of attack and the generous way in which they backed the officials entrusted stand in strong contrast with the parsimony and half-hearted policy adopted by our own Board of Agriculture. Briefly the plan of attack decided upon was to introduce the various insects parasitic upon these moths. This was done by importing from Europe huge consignments of the egg-masses, larvæ, and pupæ of these moths, which were then placed in cages, in order that the parasites these contained might be hatched out and released in the infested areas, while the non-parasitized specimens were destroyed.

In justice to this theme, and the authors, it would be unfair in the space at our disposal to attempt to review the history of these parasites—principally micro-hymenoptera and beetles—or the results of the experiment. Those who are interested in the matter will naturally prefer to gain this information at first hand.

But a word must be said as to the many difficulties the investigators have been called upon to surmount. The most serious of these for a long time was the danger to health. An army of assistants was needed to seek for and sort out parasitized larvæ; and these workers suffered severely on account of the irritation caused by the fine hairs which cover the larvæ. This insidious armature forced its way through the skin of the examiners, and, worse, effected an entrance into the throat and lungs, causing such distress as to

endanger the lives of one or two engaged in this laborious work. Even now, when special precautionary measures have been devised, the work of examination is attended with real and considerable discomfort.

Finally, this treatise is most exhaustive in its scope and profusely illustrated.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

January 10th, 1912.—Prof. W. W. Watts, Sc.D., LL.D., M.Sc., F.R.S., President, in the Chair.

The following communication was read :—

‘On a Late Glacial Stage in the Valley of the River Lea, subsequent to the Epoch of River-Drift Man.’ By S. Hazzledine Warren, F.G.S. With Reports on the Flowering Plants, by Francis J. Lewis, M.Sc., F.L.S.; on the Mosses, by H. N. Dixon, M.A., F.L.S.; on the Mollusca, by Alfred Santer Kennard, F.G.S., & Bernard Barham Woodward, F.L.S., F.G.S.; on the Coleoptera, by C. O. Waterhouse, I.S.O., F.E.S.; on the Entomostraca, by D. J. Scourfield, F.R.M.S.; and on the Microscopic Examination of the Sandy Residue, by George Macdonald Davies, F.G.S.

The paper describes a carbonaceous deposit, discovered by the Author, which is embedded in the low-level River-Drift gravel of the Lea Valley, in the neighbourhood of Ponder's End. It belongs to the close of the Pleistocene Period, and is very much later than the Moustierian deposits. It may be of Magdalenian age, but there is no evidence to suggest this. It is more probably post-Magdalenian, formed during the time of the supposed archaeological hiatus between the Palaeolithic and the Neolithic Epochs. The deposit yields a varied fauna and flora, which has been the subject of extended investigation. The results of this are embodied in the reports which are appended to the paper. The conclusions arrived at in these reports are in close agreement with each other, and indicate climatic conditions similar to those now found in Lapland. The evidence of this comparatively late Arctic climate in the South of England is important. It throws much light on many vexed questions, particularly with regard to the relationship of Palaeolithic man to the Glacial Period. It may have been the Arctic conditions represented by the Ponder's-End stage (as it might appropriately be named) which caused the migration of Palaeolithic man to less inclement regions. The correlation is also suggested between the Ponder's-End stage and the ‘Trail’ of the Rev. O. Fisher. The evidence is further interesting, as showing another important fluctuation of climate during the Pleistocene Period.

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 52. APRIL 1912.

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XXXVIII.—*Descriptions and Records of Bees.*—XLIII.

By T. D. A. COCKERELL, University of Colorado.

*Nomia (Reepenia) eboracina*, sp. n.

♂.—Length about 10 mm.

Black and ferruginous; eyes large; facial quadrangle about twice as long as broad; inner orbits concave above; ocelli large; supraclypeal area convex; clypeus with a median keel; whole face below antennæ, labrum, and mandibles (except apex) light ochre-yellow; antennæ ferruginous, the flagellum dusky above and more or less so beneath toward apex, only slightly crenulate; tongue long and linear; labial palpi with first joint about as long as next two combined, the last three subequal; maxillary palpi slender, with six subequal joints, the apical ones a little longer than the others; head and thorax with moderately abundant dull white hair; hair of middle of face not hiding surface; mesothorax granular, with very fine shallow punctures; scutellum bigibbous, the prominences with distinct apices; two very obscure stripes on mesothorax, a band along hind margin, and sides of mesothorax and scutellum more or less, dull reddish; tubercles reddish, fringed with dense yellowish-white hair; area of metathorax irregularly rugose, pointed behind in middle; tegulæ moderate for *Nomia*, light amber-colour. Wings rather dusky hyaline,

*Ann. & Mag. N. Hist. Ser. 8. Vol. ix.*

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with dark stigma and nervures; first r. n. joining second s.m. beyond middle; third s.m. much broader above than second. Legs entirely clear honey-colour, with glittering slightly yellowish hair; hind legs slender, quite normal. Abdomen beneath and the first segment broadly at sides ferruginous; hind margins of dorsal segments broadly reddish hyaline: apex with the two short spines of *Reepenia*; stipites very long and slender, moderately curved, slightly bulbous at end, not hairy; sagittæ long, simple, tapering apically.

*Hab.* Cape York, Queensland, 1909 (*W. W. Froggatt*, 68).

Closely related to *Nomia variabilis*, Friese, of which it is the mainland representative. It could perhaps be regarded as a subspecies of *variabilis*, but since it is quite isolated from the other forms, it seems best to regard it as a species. I now feel convinced that when the mouth-parts and abdominal structures of *Tetralonia brevicornis*, Smith, have been carefully examined that species will also fall in *Reepenia*. From *brevicornis* and *variabilis* the new species is most easily known by the pallid legs. Owing to the coloration of the abdomen there is quite a close superficial resemblance between *N. eboracina* and *N. tomentifera* (Friese).

#### *Paracolletes crassipes*, Smith.

Professor Froggatt has taken both sexes in New South Wales. Two males before me come from Leura, Jan. 5 and 20, 1903.

Smith described only the female. The male is similar, but less robust, with a thick flagellum which is strongly crenulated beneath, while all the knees, tibiæ, and tarsi are ferruginous. The face is covered with long, pale, ochreous-tinted hair. The abdominal segments are distinctly greenish, with broad reddish hind margins.

#### *Paracolletes crassipes leptospermi*, subsp. n.

♂.—Length about 12 mm.

Head and thorax black; first abdominal segment black, with the hind margin broadly pale reddish; the other segments dark greenish (the second greenest), with the hind margins broadly ferruginous; face covered with yellowish-white hair; cheeks with long white hair; mouth-parts typically Colletiform; mandibles black, reddish in middle; flagellum long, ferruginous beneath; facial quadrangle much longer than broad; mesothorax and scutellum shining, with



scattered punctures, scutellum bigibbous; hair of mesothorax and scutellum warm fuscous, but of postscutellum, metathorax, and pleura white; area of metathorax very large, smooth and brilliantly shining; tegulae ferruginous. Wings faintly dusky, nervures rufo-fuscous; stigma almost obsolete; b. n. falling a very little short of t.-m. Legs more or less reddish, anterior tibiae clear ferruginous in front.

*Hab.* Mackay, Queensland, Sept. 1898, at flowers of *Leptospermum* (Turner, 308). British Museum.

Exceedingly close to the male of *P. crassipes*, but smaller, with light hair on posterior edge of hind tibiae (fuscous in *crassipes*); it appears to be a northern subspecies of *P. crassipes*.

*Paracolletes rebellis*, sp. n.

♂.—Length 13 mm. or rather over.

Another species closely resembling *P. crassipes*, but certainly distinct, differing as follows:—The large triangular area of metathorax strongly longitudinally sulcate in the middle and finely transversely striate; the abundant hair of mesothorax and scutellum light ferruginous, not at all fuscous; mandibles red; fourth antennal joint longer; nervures ferruginous; sides of second abdominal segment red basally. The flagellum is very long, ferruginous beneath. The genitalia resemble those of various *Colletes*, except that the very broad stipites are not hairy at the end.

*Hab.* Melbourne, Victoria, Aug. 1900 (*C. French*). Turner collection, British Museum.

In my first arrangement of the specimens I had confused *P. rebellis* with *P. leptospermi*, but it is very different in the structure of the metathoracic enclosure.

*Paracolletes platycephalus*, sp. n.

♀.—Length about 10 mm.

Black, with the abdomen bright ferruginous red, the first segment suffusedly blackish on its anterior face, the second with a conspicuous black spot on each side; head very broad, with white hair, thin on sides of face, abundant on cheeks beneath; clypeus shining, sparsely but strongly punctured, flattened in middle; supra-clypeal area elevated, with a flattened smooth triangular face; mandibles dark, bidentate; antennae black, or flagellum a little reddish apically; flagellum short and thick; mesothorax microscopically tessellate, shining or dullish, rather closely punctured

at sides, but hardly at all in middle; area of metathorax with a strong transverse keel, and above the keel with irregular longitudinal raised lines: hair of tubercles and surrounding parts yellowish, of pleura and metathorax whiter, of mesothorax and scutellum fuscous; tegulae ferruginous or reddish fuscous. Wings dusky hyaline; nervures and stigma fusco-ferruginous; stigma quite large; b. n. meeting t.-m.; cubital nervure arched upwards; second s.m. small, strongly contracted above, receiving first r. n. toward its end; third s.m. large; second r. n. meeting third t.-c. Legs black, with small joints of tarsi ferruginous: anterior tibiae stained with ferruginous in front; hair on inner side of tarsi yellowish, on outer side of hind tibiae long and largely fuscous. Abdomen without hair-bands; hair at apex dark sooty.

*Hab.* Type from Victoria, Feb. 1901 (*C. French*): Turner collection, British Museum. Another from Windsor, Victoria (*C. French*): Froggatt collection, 77.

Resembles *P. fimbriatus* (Smith), but readily separated by the dark legs and venation. By the same characters it is separated from *P. fimbriatus*, Ckll. By the red abdomen, with a spot on each side of second segment, it resembles *P. bimaculatus* (Smith), but it differs in the colour of the pubescence, in the legs, &c. The hind spur is very finely pectinate, with many very slender long spines. Superficially *P. platycephalus* looks like the South-American *Perditomorpha bruneri*, Ashm.

*Paracolletes eugeniarum*, sp. n.

♀.—Length about 11 mm.

Unusually narrow; black, with the hind margins of the abdominal segments depressed, broadly whitish hyaline, the part just before the depression reddened; pubescence dull white, but dark fuscous on vertex behind ocelli, and a little fuscous on anterior part of scutellum; head broad, eyes short; mouth-parts typically Colletid; clypeus dullish, obscurely punctured; lower part of supraclypeal area well punctured; scape black, flagellum bright clear ferruginous beneath except at extreme base; mesothorax shining, rather closely punctured; area of metathorax with five transverse ridges; pleura densely sculptured, partly vertically striate; tegulae pale amber. Wings hyaline, nervures and stigma dusky ferruginous; stigma very small and slender; b. n. falling a little short of t.-m.; second s.m. quite broad, receiving first r. n. near its base; second r. n. reaching third s.m. a short distance before end. Abdomen shining, the

basal half of the segments very minutely punctured; hair of abdomen thin and white, with scarcely defined bands, hair about apex fuscous; apical plate very broad. The anterior and middle knees are reddened. Hind spur with long strong teeth.

*Hab.* Mackay, Queensland, at flowers of *Eugenia*, Nov. 1899 (*Turner*, 321). British Museum.

*P. eugeniarum* is a rather peculiar species. In my table of Smith's "*Lamprocolletes*" (*Trans. Amer. Ent. Soc.* xxxi. 345) it runs to 10, and the colour of the antennæ suggests that it may be the female of *P. antennatus* (Smith), but the venation is different. It also seems to fall near *P. argenti-frons* (Smith), known only from the male; I believe it is really very close to *argenti-frons*, but almost certainly not identical, especially as Smith's species comes from Swan River. (For additional notes on *P. argenti-frons* see *Trans. Amer. Ent. Soc.* xxxvi. 204.) *P. perfasciatus*, Ckll., is also apparently allied.

The stout teeth of the hind spur in *P. eugeniarum* are very different from the numerous slender spines of *P. platycephalus*. The third s.m. of *P. eugeniarum* is a little broader above than the second, and the third t.-c. strongly bulges outward.

*Gastropsis victoriae*, Cockerell, var. *a*.

♂.—Abdomen and anterior part of mesothorax with a greenish lustre; mesothorax with much black hair, except on the anterior third, where it abruptly changes to yellowish white; all the hair of second abdominal segment long and white; segments 3 to 5 with narrow and rather inconspicuous white marginal hair-bands; sixth segment with long fuscous hair.

*Hab.* Western Australia, 1909 (*Froggatt*, 47).

This is probably a distinct subspecies, but the original types of *G. victoriae* had been in some liquid, and the description of the pubescence was defective. More material is needed to show whether there are separable forms in W. Australia, S. Australia, and Victoria.

*Andrena milwaukeensis*, Graenicher.

This fine species, described from Wisconsin, has been taken by Miss Eleth Cattell at Garrison, New York.

*Andrena hirticincta*, Provancher.

Woods Hole, Massachusetts (*Eleth Cattell*).

*Andrena carlini*, Cockerell.

Garrison, New York (*Eleth Cattell*).

*Andrena cratægi*, Robertson.

Garrison, New York (*Eleth Cattell*).

*Andrena rugosa*, Robertson.

Garrison, New York (*Eleth Cattell*).

*Andrena flavoclypeata*, Smith.

Garrison, New York (*Eleth Cattell*).

*Andrena forbesii*, Robertson.

Garrison, New York (*Eleth Cattell*).

*Andrena thaspii*, Graenicher, var. *a*.

Foley's yard, Bloomington, Indiana, at cherry blossoms (*Max M. Ellis*).

Differs from typical *A. thaspii* by having the facial foveæ strongly reddish and the mesothorax entirely dull. This may perhaps be identical with *A. mandibularis*, Rob., which I know only from descriptions, but Robertson does not state whether the foveæ of that species are reddish. Viereck, in Entom. News, 1907, p. 287, makes *thaspii* a synonym of *mandibularis*, but in the separate copy he sent me he has erased *mandibularis*, leaving *thaspii* as valid.

*Colletes inæqualis*, Say.

Bloomington, Indiana; six females at flowers of wild crab-apple trees on Campus of University of Indiana (*Max M. Ellis*). On the same flowers, in the same locality, Dr. Ellis collected males of *Xylocopa virginica*, Drury.

*Prosopis chromatica* (Cockerell).

I described this from the female as a variety of *P. albopilens*, Ckll. The male (Mackay, Nov. 1891, *Turner*, 713 in part) shows that it is a distinct species, for it has wholly dark mandibles and the broader face is ivory-white, contrasting with the pale yellow tubercles, while the lateral



face-marks are broader at base, regularly tapering to a sharp point. Mr. Turner took both *P. albonitens* and *P. chromatica* at flowers of *Xanthorrhoea*.

*Allodape simillima*, Smith.

Smith described the female. Two males come from Mackay, Queensland, January 1899 and 1900 (*Turner*, 716). They are 7 to 7½ mm. long, like the female, but with the eyes very large, face narrowed below; clypeus ivory-white, constricted in middle; almost linear lateral face-marks; a large white spot on labrum; middle and hind basitarsi white.

Mr. Turner also took *A. unicolor*, Smith, at Mackay (March 1900).

*Pachyprosopis obesa*, sp. n.

♀.—Length about 7 mm.

Head and thorax very robust; abdomen large and broad, though rather short; head and thorax black, without light markings; mandibles dark reddish; scape clear reddish orange; flagellum short and thick, ferruginous, suffusedly dusky above; clypeus and supraclypeal area shining, with scattered punctures; front also shining, but with much finer and closer punctures; facial foveæ very distinct, linear, ending below at about level of middle of scape, and above curving over to the lateral ocelli; ocelli rather small; mesothorax and scutellum nude, shining, with scattered small punctures, which are closer on hind part of mesothorax and on scutellum; tubercles with a fringe of dull white hair; pleura not hairy; area of metathorax triangular, without evident sculpture; all the tibiæ and tarsi bright ferruginous, as also anterior femora at apex, middle femora except beneath, and hind femora entirely; tegulae piceous. Wings dusky hyaline; stigma and nervures yellowish brown; b. n. strongly arched, falling far short of t.-m.; first r. n. meeting first t.-c.; second s.m. more or less wedge-shaped, higher than long, produced to a point above. Abdomen dull dark ferruginous, with variable transverse dusky clouds on the segments.

*Hab.* Sydney, New South Wales, Nov. 29, 1910 (*W. W. Froggatt*, 127); 2 ♀.

A very distinct species, known from all others by its thick and wholly black head and thorax, combined with an orange scape and a red abdomen.

*Pachyprosopis nitidiceps*, sp. n.

♀.—Length about  $4\frac{1}{2}$  mm.

Black, not more robust than *Euryglossa*; head nearly round seen from in front, not especially large, brilliantly shining, with scattered punctures; ocelli small; front with a median groove; mandibles dark, obscurely reddish subapically; eyes converging below; scape black; flagellum short and thick, ferruginous beneath; mesothorax dullish, with inconspicuous scattered punctures; scutellum rather more shining, having a sort of glaucous tint; area of metathorax not distinctly defined. Legs black, with the tarsi reddish, the anterior tibiae ferruginous, suffused with blackish behind, and the middle tibiae ferruginous in front, the hind knees also ferruginous; tegulae rufo-testaceous. Wings hyaline, faintly dusky, the large stigma and the nervures ferruginous; b. n. strongly arched, not reaching t.-m.; first r. n. meeting first t.-c.; second s. m. narrow and pointed above, yet broader (longer) than in some species, its lower side being about equal to that on first t.-c.; abdomen broad, shining, the hind margins of the segments brownish. The compound microscope brings out the following details:—Abdominal segments finely transversely lineolate; base of metathorax with a very irregular and delicate raised reticulation; scutellum closely punctured posteriorly; hind spur with very strong teeth; mesothorax very minutely transversely lineolate.

*Hab.* Mackay, Queensland, November 1893 (*Turner*). British Museum.

Readily known by the small size and black colour; *P. flavicauda*, Ckll., which it most resembles, has the end of the abdomen orange.

*Halictus punctatus*, Smith.

In Smith's description read "mesothorax (not metathorax) green." The metathorax is black, with fine raised lines. The abdomen varies to nearly all red except the base. The specimens before me are labelled as follows:—Sydney, N.S.W., Nov. 29, 1910 (*Froggatt*, 124); Rutherglen, Victoria, 1909 (*French*; Froggatt collection, 88); Melbourne, Victoria, Aug. 1900 (*French*; Turner collection).

*Halictus dotatus*, sp. n.

♀.—Length about  $5\frac{1}{2}$  mm.

Head and thorax green, abdomen and legs bright ferruginous; head ordinary, metallic green, not very bright;

labrum, mandibles, and lower margin of clypeus light ferruginous; front dull and minutely granular; scape slender, light ferruginous; flagellum ferruginous beneath; mesothorax very bright green, shining, very finely punctured; scutellum shining, rather more brassy; metathorax dark bluish green, the area with fine wrinkles, those about the middle transverse; pleura coloured like metathorax. Legs entirely light ferruginous, hind spur simple; tegulae light rufo-testaceous. Wings clear; stigma and nervures honey-colour, the stigma large. Abdomen shining ferruginous, with slight transverse dusky clouds, but base not dark.

*Hab.* Sydney, New South Wales, Nov. 29, 1910 (*Froggatt*).

The type is gummed on a card with a specimen of *H. punctatus*; they were probably taken at the same spot. *Halictus dotatus* is related to *H. vitripennis*, Smith, but the scape is red and the base of the abdomen is not black. The red lower part of clypeus is also distinctive. The mesothorax is more shining and much brighter green than in *H. eyrei*, Ckll.

*Halictus dampieri*, Cockerell.

A new locality is Kuranda, Cairns, Queensland, Dec. 1901 (*Turner*). A long series of females taken by Mr. Turner at Mackay is all from flowers of *Eugenia*, except one from *Cassia*.

*Halictus behri transvolans*, subsp. n.

♀.—Clypeus yellowish green varying to blue-green; supraclypeal area brass-colour or concolorous with the front and sides of face; mesothorax peacock-green; scutellum brassy green varying to peacock-green; abdomen shining dark green; scape black, with a minute red spot at extreme base; underside of flagellum wholly pale ferruginous.

*Hab.* Mackay, Queensland, March 1900 and Jan. 1890 (*Turner*, 757).

Close to *H. flindersi*, Ckll., and having the same ventral scopa on abdomen and transverse lineolation in front of anterior ocellus, but easily separated by the ferruginous (variously infuscated) tibiae and tarsi. The type is in the British Museum.

*Halictus forresti*, Cockerell.

Five males before me, taken by Mr. Turner at Mackay, are all from flowers of *Eucalyptus* in March.

*Halictus sturti*, Cockerell.

Ten females are before me, taken at Mackay by Mr. Turner; eight are from flowers of *Cassia* in December, two were collected in March without flower record.

*Halictus urbanus*, Smith.

Sydney, N.S.W., Dec. 1, 1910 (*Froggatt*, 114).

*Halictus inclinans*, Smith.

Windsor, Victoria, 1909 (*French*; *Froggatt* collection, 90).

This species and the last are both said by Smith to come from Champion Bay.

*Halictus saycei*, sp. n.

♀.—Length  $4\frac{1}{2}$ –5 mm.

Form ordinary, thorax small; black, with the dull and granular mesothorax dark green; the abdomen smooth and shining, with very little hair, and wholly without bands; mandibles, knees, tibiae (middle and hind ones more or less infuscated), tarsi, and extreme apex of abdomen ferruginous; scape slender, red basally; flagellum dark; tegulae shining apricot-colour. Wings hyaline, venation of *Chloralictus*, stigma rather dilute brown, nervures paler, second s.m. receiving first r. n. a short distance from its end; tubercles partly reddish; area of metathorax granular, shining apically; hind spur with about three short nodule-like teeth. Ventral side of abdomen with a well-developed scopa of curled hairs. The compound microscope shows the following:—Front finely striate, no transverse striae below ocelli; mesothorax roughened and punctured, anteriorly very finely, rather obliquely, transversely lineolate; basal part of metathoracic area with vermiform rugae, apical part microscopically tessellate; abdomen transversely lineolate; hairs of caudal rima pale orange, beautifully plumose.

*Hab.* Mackay, Queensland, April 1900, 2 ♀ (*Turner*, 7 c). British Museum.

Resembles the Tasmanian *H. limatus*, Smith, but differs in the sculpture of the thorax.

*Halictus kesteveni*, sp. n.

♂.—Length  $4$ – $4\frac{1}{2}$  mm.

Head and thorax dark green, metathorax blue, abdomen shining black, without bands; clypeus and supra-clypeal area



shining, but front and mesothorax dull; mandibles bright red at apex, orange in middle, dark at base; labrum and margin of clypeus dark; antennae comparatively short and thick, like those of a female; scape black, flagellum dull ferruginous beneath; scutellum shining green; area of metathorax shining, with irregular rugae not covering the surface; tegulae testaceous. Wings clear, nervures and stigma reddish sepia; venation of *Chloralictus*, but first r. n. entering extreme base of third s.m. Legs black, with the knees, anterior tibiae, apices of the other tibiae, and all the tarsi ferruginous. Abdomen only moderately narrow. The compound microscope shows:—Front very minutely cancellate, not striate; mesothorax coarsely lineolate or subtessellate, with scattered punctures.

*Hab.* Kuranda, Cairns, Queensland, March 1902 (*Turner*). British Museum. Also a co-type from Cape York, May 1902 (*Turner*).

Superficially much like *H. saycei*, but the differences in colour and sculpture show that it cannot be its male.

*Halictus paracolletinus*, Cockerell.

A male from Kuranda, Cairns, April 1902 (*Turner*), shows that this sex resembles the female, with the following principal sexual differences:—Face much narrower, front and sides of face densely covered with orange hair; lower half of clypeus and a wedge reaching upper margin pale yellow; antennae very long, flagellum ferruginous beneath; anterior knees, tibiae, and tarsi ferruginous, the tibiae clouded with dusky.

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XXXIX.—*The Anatomy and Classification of the Symbranchoid Eels.* By C. TATE REGAN, M.A.

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[Plate IX.]

IN most recent systems of classification the Symbranchii appear as an order (or suborder) which is placed near the Apodes. It seems probable, however, that they are derived from some group of acanthopterous physoclists and that the resemblances to the true Eels are not due to relationship, since in *Alabes* the præmaxillaries have long posterior

pedicels and jugular pelvic fins are present. Vaillant (Comptes Rend. cxl. 1905, p. 1713) has recently expressed the opinion that the affinities of *Alabes* are with the Blennioids rather than with the Symbranchidæ, and, indeed, its external similarity to the Scytalinidæ and Zoarcidæ is rather striking; but in its osteology *Alabes* differs widely from the Blennioids, and although it also differs sufficiently from the Symbranchoids to be made the type of a separate suborder, its relationship to them is quite clear; the more important characters common to *Alabes* and the Symbranchoids are given in the ordinal diagnosis, and the differences between them will be seen on comparison of the subordinal diagnoses in the following systematic account.

### Order SYMBRANCHII.

Eel-shaped Teleosts, with the caudal fin very small, 8- to 10-rayed, and continuous with the dorsal and anal, which are rayless folds of the skin; no pectoral fins; pelvics, if present, jugular. No air-bladder. Mouth non-protractile, bordered above mainly by the præmaxillaries; lower jaw of dentary, articulare, and angulare. Gill-membranes united and gill-openings confluent below, but more or less restricted from above, typically appearing as a transverse ventral slit. Palatine without maxillary process; no mesopterygoid; metapterygoid extending upwards to sphenotic; nyomandibular two-headed; symplectic present; opercles normal. Upper surface of skull without crests or ridges; no basisphenoid, alisphenoid, orbitosphenoid, or episthotic; sphenotic with a rather prominent projection directed outwards and somewhat forwards; exoccipital condyles widely separated; nasals long, separated by the ethmoid; a præorbital, but no suborbitals. Only the membrane bones of the pectoral arch developed, the coracoids and radials absent. Vertebral centra co-ossified with the arches; no ribs, but a series of epipleurals.

#### Suborder 1. ALABETOIDEA.

Vent in the anterior half of the length of the fish. Dorsal and anal well developed; pelvic fins present, very small, 2-rayed, just behind the gill-opening. Mouth small; palate toothless. Præmaxillaries with strong posterior pedicels which reach the frontals; palatines separated by the vomer; pterygoid slender, remote from the frontal; operculum rhomboidal. Skull short, broad, depressed; parasphenoid and frontal separated by an interspace; parietals not meeting

above the supraoccipital. Pectoral arch attached to the skull by a forked post-temporal. Caudal vertebræ more numerous than the præcaudals; posterior præcaudals with downwardly directed parapophyses; epipleurals sessile.

### Family 1. Alabetidæ.

This family includes the single genus *Alabes*, Cuv. (*Chilobranchus*, Richards.), little fishes of the coasts of Australia, known as "Shore Eels." The body is naked; the snout is blunt and the eyes are placed far forward; the mouth is small, terminal, and the blunt compressed teeth are arranged in a single series in the jaws. In *A. dorsalis* I count 75 vertebræ (23+52); parapophyses are developed on the last 8 præcaudals only, they are downwardly directed and gradually increase in length until they form closed hæmal arches in the caudal region.

### Suborder 2. SYMBRANCHOIDEA.

Vent in the posterior half of the length of the fish. Dorsal and anal vestigial; no pelvic fins. Mouth moderately large; palate with a crescentic band or series of teeth on the palatines and pterygoids. Præmaxillaries without posterior pedicels; palatines meeting below the vomer; pterygoid expanded, attached throughout its length to the frontal; operculum subtriangular. Skull elongate; parasphenoid and frontal united by a long suture; parietals meeting above the supraoccipital. Præcaudal vertebræ more numerous than the caudals; all the præcaudals (except the first) and the anterior caudals with transverse processes bearing the epipleurals; posterior præcaudals also with downwardly directed parapophyses, which are replaced by closed hæmal arches in the caudal region.

### Family 1. Symbranchidæ.

There are no respiratory sacs and the pectoral arch is attached to the skull by a forked post-temporal; the body is naked.

### Synopsis of the Genera.

I. Eyes developed; gill-opening small; teeth in bands.

Gills well developed, on 4 branchial arches;

vertebræ 127-137 (76-80+51-57) .... 1. *Symbranchus*.

Gills vestigial, on 3 branchial arches only;

vertebræ 188 (100+88) ..... 2. *Monopterus*.

- II. Eyes vestigial: gill-opening wide, extending upwards above the middle of the side; teeth in a single series, minute on the præmaxillaries, well developed and obtusely conical on the palate and lower jaw; gills as in *Symbranchus*; vertebrae about 100.

3. *Macrotrema*, gen. nov.

*Symbranchus* includes three species from the fresh and brackish waters of tropical countries—one from Central and South America, another from West Africa, and the third from the East Indies. *Monopterus* comprises a single species widely distributed in the rivers of southern and eastern Asia. The new genus *Macrotrema* is established for *Symbranchus caligans*, Cant., which differs from *Symbranchus* not only in structural characters, but in its smaller size and marine habit. Cantor's type from Pinang, 200 mm. in total length, is in the British Museum; also a second specimen of 160 mm. from Singapore.

## Family 2. Amphipnoidæ.

*Amphipnous cuchia*, from the fresh and brackish waters of tropical Asia, differs from the Symbranchidæ especially in the development of a pair of respiratory sacs, diverticula of the pharynx which lie on each side of the vertebral column above the gills and between the skull and the pectoral arch. All the other features in which *Amphipnous* differs from the Symbranchidæ, except the presence of scales on the body, are connected with the presence of these sacs; thus the skull is shorter, the operculum and suboperculum are produced backwards into very thin, almost membranous laminae, and the pectoral arch is separated from the skull, with consequent reduction or disappearance of the post-temporal. Gills are developed on the second branchial arch only. The vertebrae number 171 (106 + 65).

## EXPLANATION OF PLATE IX.

*Figs. 1-4. Monopterus javanensis.* 1, jaws, suspensorium, and opercles; 2, skull from above; 3, skull from the side; 4, skull from behind.

*Figs. 5-8. Alabes dorsalis* (5 and 6  $\times 2$ , 7 and 8 still more enlarged). 5, skull from above; 6, skull from below; 7, upper jaw; 8, lower jaw.

*pma*, præmaxillary; *mx*, maxillary; *den*, dentary; *ar*, articulare; *an*, angulare; *pal*, palatine; *pt*, pterygoid; *q*, quadrate; *mt*, metapterygoid; *hm*, hyomandibular; *sy*, symplectic; *pop*, præoperculum; *op*, operculum; *sop*, suboperculum; *iop*, interoperculum; *n*, nasal; *eth*, ethmoid; *leth*, lateral ethmoid; *v*, vomer; *psp*, parasphenoid; *f*, frontal; *p*, parietal; *spo*, sphenotic; *pto*, pterotic; *epo*, epiotic; *pro*, pro-otic; *soc*, supra-occipital; *eoc*, exoccipital; *boc*, basioccipital; *t*, temporal plate.



XL.—*On Mammals from Central Asia, collected by Mr. Douglas Carruthers.* By OLDFIELD THOMAS.

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DURING the summers of 1910 and 1911 Mr. Douglas Carruthers made, in company with two friends, Messrs. J. H. Miller and M. P. Price, an extended collecting-tour through the mountainous region of Central Asia. Commencing at Munnusinsk, on the Upper Yenisei, shortly after leaving the Siberian Railway, the party worked through the Syansk Mountains into N.W. Mongolia, then through the Tamu-ola Mts., the Altai, the Barlik Mts., N.W. Dzungaria, along the Thian Shan chain eastwards to the interesting Hami Mts., then back to the Muzart Valley and Kuldja. Lastly, *viâ* Yarkand and the Karakoram, the party travelled to India, and so home to England.

The whole of this great region, down at least to Yarkand, was previously almost entirely unrepresented in the small mammal department of the British Museum, so that the fine collection made by Mr. Carruthers, and now acquired by the Museum, is therefore of the utmost value and interest. Quite a considerable number of the forms have proved to be new, and all are most desirable accessions, greatly increasing our knowledge of the fauna of this little-known part of the world.

It is impossible to speak too highly of the care and enthusiasm devoted by Mr. Carruthers to the making of this collection, which is throughout of the high standard to which his previous work has accustomed us. About 180 specimens are contained in it, belonging to 48 species, the high proportion of species being due to the varied regions through which the party passed and to their seldom stopping long enough in any place to obtain really large series of single species.

Five species and subspecies belonging to this collection were described by me in the 'Annals' for December 1911, one has been described by Mr. G. S. Miller in America, and ten new forms are now named, making a total of sixteen novelties obtained during Mr Carruthers's expedition.

A previous collection made by Mr. Carruthers in Turkestan was worked out in the 'Annals' in 1909\*.

\* Ann. & Mag. Nat. Hist. (8) iii. p. 257 (March 1909).

1. *Sorex araneus borealis*, Kashtsch.

♂. 173; ♀. 162. Syansk Mts., 100 miles W. of Lake Baikal.

2. *Sorex centralis*, Thos.

♂. 178, 179, 181; ♀. 180. Syansk Mts., 101 miles W. of Lake Baikal. 4000-7000'.

Described Ann. & Mag. Nat. Hist. (8) viii. p. 758 (1911). No. 180 (12. 4. 1. 6) the type.

3. *Crocidura ilensis*, Mill.

♀. 231. Steppe S. of Tarbagatai Mts., Dzungaria. 1000'.

4. *Talpa* (? *suschkini*, Kashtch.).

♀. 152, and separate skull no. 157. 100 miles S.E. of Minusinsk, Upper Yenisei. 1000'.

In his work on W. Siberian Insectivora Prof. Kashtchenko puts "*var. suschkini*" for a Sayanow specimen which is said to agree with *T. altaica* in all respects except that the eye and its aperture are minute. This character being quite valueless, and no other particulars being mentioned, it is impossible to be certain whether the present specimens, which differ from *altaica* in the size of their teeth, are really referable to *suschkini*, but it seems advisable provisionally to put them under that name.

5. *Martes zibellina*, L.

♂. 184; ♀. 183. Skulls only. Tapsa Mts., N.W. Mongolia.

Found in a fur-hunter's hut.

A comparison of these skulls with some from Kamtchatka indicates that the peninsula animal ought certainly to be distinguished from the Siberian on account of its greater size. It should be called *M. asiaticus*, the material used in Brandt's paper on "*Mustela zibellina*, var. *asiatica*"\*, having been mainly Kamtchatkan, and the original of pl. i. having been from that country. If this name were put aside as synonymous with *zibellina* itself, some more unsuitable name from the same paper (e. g. *ochraceus* or *maculatus*) would have to be adopted.

\* Mém. Ac. St. Pétersb. (6) ix. Sci. Nat. vii. p. 1 (1855).

6. *Putorius larvatus michnoi*, Kashtch.

♂. 187. Kemtchik Valley, Tannu-ola Mts. 2500'.

♂. 200. Kunderlun Plateau, Atchit Nor, N.W. Mongolia. 8300'.

Described by Kashtchenko \* as a variety of *P. evermanni*, but evidently a race of, if not identical with, *P. larvatus*, Hodgs., the Tibetan polecat.

7. *Sciurus vulgaris calotus*, Hodgs.

♂. 177; ♀. 165. Syansk Mts., 100 miles W. of Lake Baikal. 1500'.

♂. 227. Kran Valley, Great Altai. 4000'.

Or *S. v. martensi*, Matsch., which was based on Middendort's description of the squirrel of the Lower Yenesei.

8. *Eutamias asiaticus*, Pall.

♂. 153, 155; ♀. 151, 156. 100 miles S.E. of Minnusinsk, Yenisei. 1000'.

9. *Citellus evermanni*, Brandt.

♂. 150. Minnusinsk, Upper Yenisei. 800'.

♂. 185. Kemtchik Valley, Tannu-ola Mts., N.W. Mongolia. 3000'.

♂. 194, 195, 196. S. side, Tannu-ola Mts. 7000'.

♀. 206. Mts. W. of Atchit Nor, N.W. Mongolia. 5500'.

♂. 303. Ala-tau Mts., N.W. Dzungaria. 7000-8000'.

10. *Citellus carruthersi*, sp. n.

♂. 279, 280, 281, 283; ♀. 277, 278, 282, 293 (and separate skulls, 266, 267). Barlik Mts., S. side, N.W. Dzungaria. 5000-7000'.

Like *C. erythrogenys*, but much smaller and with only five pairs of mammae.

General characters of *erythrogenys*. Size very much smaller. Colour above pale mottled isabella, the shoulders paler grey than the back. Head-markings as in *erythrogenys*, the supraorbital reddish lines clearer reddish, or rather ochraceous, not so dark as in *erythrogenys*. Under surface broadly washed with dull buffy whitish. Hands and feet cream-buff. Tail buffy, the hairs above more or less ringed with black. Mammæ 5 pairs only instead of 6.

\* Ann. Mus. St. Pétersb. xv. p. 271 (1911).

Skull in general character quite the same as in *erythro-genys*, with the same widely expanded zygomata, but considerably smaller throughout.

Dimensions of the type (measured in flesh) :—

Head and body 197 mm.; tail 42; hind foot 34; ear 8.

Skull: greatest length 45.2; condylo-incisive length 42; zygomatic breadth 30.4; nasals 16.5 × 6.8; interorbital breadth 8.3; posterior breadth on tympanics 24; palatilar length 22.6; diastema 10.5; palatal foramina 2.8; upper tooth series exclusive of small premolar 9.2.

*Hab.* as above.

*Type.* Young adult female. B.M. no. 12. 4. 1. 34. Original number 282. Collected 19th June, 1911.

This Barlik souslik may have been included by other authors under *C. erythro-genys*, but a comparison of Mr. Carruthers's very uniform series with some specimens from Biisk, obtained and presented by Mr. J. H. Miller in 1908, shows at once that there are two members of the group, differing both in size and the number of their mammae.

The original *erythro-genys* of Brandt was first described as from the Altai (Gebler), and later on the Alai River was mentioned as its habitat. This river runs into the Ob at Barnaul, and is not far from Biisk, so that our specimens from the latter place may be provisionally accepted as typical.

I have named this distinct species in honour of its discoverer, Mr. Carruthers, to whose hard work and enthusiasm the present fine collection is due.

#### 11. *Marmota centralis*, Thos.

?♂. 228. Kran Valley, Great Altai. 2300'.

♀. 291. Barlik Mts., N.W. Dzungaria. 7300'.

♂. 300, 301, 302. Ala-tau Mts., N.W. Dzungaria. 6500–7000'.

#### 12. *Dyromys milleri*, sp. n.

♀. 255. Bogdo-ola Mts., S.E. Dzungaria. 5000'. 9th May, 1911. B.M. no. 12. 4. 1. 43. *Type.*

Near *D. angelus*, but with more rounded brain-case and smaller bullæ.

Size rather less than in *D. angelus*. General colour above wood-brown tinged with fulvous, more fulvous on crown; greyer on sides. Under surface broadly washed with cream-buff, the edges of the upper colour more strongly buffy. Top of muzzle greyish white, cheeks cream-buff, sharply defined;



black facial streak well developed, extending from in front of the eye to the outer base of the ear. Ears pale brown. Upper surface of hands and feet whitish or slightly buffy. Tail rather greyer than the body, dull drabby above, buffy below, its tip apparently regenerated in the type.

Skull, as compared with that of *D. angelus*, shorter and proportionally broader, the brain-case of the round and inflated shape found in *D. robustus*, Mill. Muzzle short, little tapering; nasals nearly parallel-sided, scarcely narrowing backwards. Interorbital region short-waisted, the edges square but not ridged. Brain-case peculiarly rounded. Palatal foramina longer than in *angelus*. Bullæ higher and more inflated, but shorter antero-posteriorly.

Dimensions of the type (measured in flesh):—

Head and body 94 mm.; tail (? perfect) 68; hind foot 20; ear 17.

Skull: greatest length 28; condylo-incisive length 25.2; zygomatic breadth 16.8; nasals 8.3 × 3; interorbital breadth 4.2; breadth of brain-case 14; combined height of brain-case and bullæ 11.4; palatilar length 9.8; diastema 6.9; palatal foramina 4; upper tooth-series 4.1.

*Hab. & Type* as above.

This pretty dormouse is most nearly allied to *D. angelus* from the western end of the Thian Shan, but is distinguished by its shorter and proportionally broader skull, its large rounded brain-case, and its short but high bullæ. I have named it in honour of Mr. J. H. Miller, its actual captor, to whose help and companionship Mr. Carruthers has been so largely indebted.

"In elm-forest in valley bottom." The specimen was being carried off by a crow, which dropped it on being shot at.

### 13. *Meriones erythrourus aquilo*, subsp. n.

♀. 249. 100 miles E. of Gu-tschen, S.E. Dzungaria. 4000'. 1st May, 1911. B.M. no. 12. 4. 1. 44. *Type*.

♀. 254. Bogdo-ola Mts., S.E. Dzungaria. 4000'.

A Dzungarian representative of *M. e. evermanni*, less closely similar to true *erythrourus*.

Size comparatively large, larger than in *M. e. evermanni*. General colour above more drabby than in the other forms, *evermanni* being rather and *erythrourus* much more sandy or buffy. Under surface with a greater amount of slaty at the bases of the hairs, and therefore less strongly white than in either of the other races. Hind feet cream-buff, white in

*eversmanni*. Tail with more black in it than in the other forms, the top more or less mixed with black to the base, and even the sides and lower surface with an intermixture of black hairs.

Skull as in the largest specimens of *erythrouros*, larger than in any of our Samarkand series of *eversmanni*. Interparietal more developed in its antero-posterior diameter, its transverse extent being about the same as in *erythrouros*. Bullæ very large, decidedly larger than in *eversmanni*.

Dimensions of the type (measured in the flesh):—

Head and body 145 mm.; tail 144; hind foot 35; ear 19.

Skull: greatest length 42.5; condylo-incisive length 37.6; zygomatic breadth 33; length of nasals 16.5; interorbital breadth 6.7; interparietal  $6 \times 8.7$ ; palatal foramina 7.7; greatest horizontal diameter of bulla 15.5; upper molar series 5.8.

*Hab. & Type* as above.

I can find no previous record of the occurrence of a gerbil of the *erythrouros* type east of the central mountain-system of Asia; but there is no doubt that the present animal is allied to that form, though it may be considered as representing a special subspecies of it. The Transcaspiian *M. eversmanni* I should also regard as a third subspecies of the Afghan form.

#### 14. *Meriones* near *kozlovi*, Sat.

♂. 238. Tur-kul Plateau, Hami Mts., Chinese Turkestan. 7000'.

The type locality of *M. kozlovi* is the Lower Kobdo.

#### 15. *Rhombomys opimus giganteus*, Büchn.

♂. 233 (immature). Hami, N.E. Chinese Turkestan. 2500'.

♀. 260, 261, 262. Manass R., Central Dzungaria. 1200'.

♂. 296; ♀. 294, 295. Barlik Mts. S., N.W. Dzungaria. 5000'.

Type locality Ebi-Nor, W. Dzungaria, the specimens from the Barlik Mts. being therefore almost topotypical.

"*Gerbillus*" *turfanensis* and "*G.*" *opimus nigrescens* are two further members of this group described by Dr. Satahin from localities by no means very distant from the present. The evidence of Mr. Carruthers's series does not appear to increase the probability of these being distinct.

16. *Mus pachycercus*, Blanf.

- ♂. 245. Tur-kul, N. Hami Mts., N.E. Chinese Turkestan. 6000'.  
 ♀. 253. Bogdo-ola Mts., S.E. Dzungaria. 3000'.  
 ♀. 319. N.E. of Aksu, Thian-Shan. 5000'.  
 ♂. 320. 100 miles S.E. of Yarkand. 4000'.  
 ♂. 321, 322. Karakoram Mts., N. side. 7000'.

17. *Apodemus* sp.

- ♂. 257. Bogdo-ola Mts., S.E. Dzungaria. 6000'.  
 ♂. 263. Manass R., Central Dzungaria. 900'.  
 ♀. 299. Ala-tau Mts., N.W. Dzungaria. 2000'.  
 ♂. 312, 314; ♀. 311, 313. Muzart Valley, Thian Shan. 8500'.  
 ♀. 318. N.E. of Aksu, Thian Shan. 5000'.  
 ♂. 325; ♀. 323, 324. Karakoram Mts. (N. side), Chinese Turkestan. 8000'.

It is impossible to be certain of the species of these mice without far more material. Some of them may be referable to *A. tscherga*, Kashtchenko, and others to *A. sublimis*, Blanford.

18. *Cricetulus phæus*, Pall.

- ♂. 232. Zairan Nor, Dzungaria. 5000'.  
 ♂. 234. Hami, N.E. Chinese Turkestan. 3000'.  
 ♂. 246, 247, 248. E. of Gu-tschen, S.E. Dzungaria. 4000'.  
 ♂. 297. Ala-tau Mts. S., N.W. Dzungaria. 2000'.  
 ♂. 326-329. Karakoram Mts. (N. side), Chinese Turkestan. 8000-9000'.

The relationship of *C. fulvus*, Blanf., to *C. phæus* needs further investigation.

19. *Evotomys* (*Craseomys*) *rufocanus latastei*, All.

- ♂. 160, 170, 175, 176; ♀. 161. Syansk Mts., 100 miles W. of Lake Baikal. 1500-2200'.

These specimens agree closely with Kamtehatkan examples representing Allen's *E. latastei*, but do not seem to be more than subspecifically separable from the Scandinavian *E. rufocanus*. The species occurs in Kashtchenko's list of Tomsk Mammalia under the latter name.

20. *Evotomys glareolus saianicus*, Thos.

♂. 158; ♀. 163, 172 (young). Syansk Mts., 100 miles W. of Lake Baikal. 1600'.

Described Ann. & Mag. Nat. Hist. (8) viii. p. 759 (1911).  
No. 163 (B.M. no. 12. 4. 1. 85) the type.

21. *Evotomys rutilus*, Pall.

♂. 164. Syansk Mts., 100 miles W. of Lake Baikal. 1600'.

22. *Arvicola terrestris*, Linn.

♀. 159. Syansk Mts., 100 miles W. of L. Baikal. 1500'.

23. *Microtus oconomus*, Pall.

♂. 166, 167, 168; ♀. 169. Syansk Mts., 100 miles W. of Lake Baikal. 2000'.

24. *Microtus arvalis*, Pall.

♂. 273, 274, 276; ♀. 265, 270, 272, 275. Barlik Mts. S., N.W. Dzungaria. 5000-7000'.

♀. 298 (young). Ala-tau Mts. S., N.W. Dzungaria. 2000'.

♀. 304. Tekes Valley, Thian Shan. 6500'.

Judging by Büchner's figure of the skull, *M. evermanni*, Pol., would seem to be either this or a related form, and not a *Stenocranius*.

Allied to *M. arvalis*, and from a locality quite close to the present, is my recently described *M. deus*, easily distinguishable by its much larger skull.

25. *Microtus agrestis mongol*, Thos.

♂. 188. Kemtchik Valley, Tannu-ola Mts., N.W. Mongolia. 4200'. B.M. no. 12. 4. 1. 102. Type.

Described Ann. & Mag. Nat. Hist. (8) viii. p. 759 (1911).

26. *Microtus arcturus*, sp. n.

♀. 269. Barlik Mts. S., N.W. Dzungaria. 6000'. 17th June, 1911. B.M. no. 12. 4. 1. 103. Type.

A large brown vole like *M. agrestis*, but with additional prisms on both  $m^1$  and  $m^2$ , as in *M. sikimensis*.

Size rather exceeding that of the larger forms of *M. agrestis*,



slightly less than in *M. sikimensis*. Fur of medium length; hairs of back about 9-10 mm. in length (summer). General colour above near broccoli-brown, not of such a warm tone as in *M. agrestis mongol*. Under surface washed with pale drab. Hands and feet dull whitish. Tail pale brown above, whitish below, the two colours not sharply contrasted.

Skull on the whole like that of a large *M. agrestis*, high, with well-marked angles and a long waist. Lateral pits of posterior palate large, deep, the septum between them reduced to a mere linear ridge. Bullae fairly large, rather larger than in European *agrestis*, decidedly smaller than in *M. a. mongol*, much larger than in *M. sikimensis*.

Teeth on the whole as in *M. agrestis*, the extra prism on  $m^2$  well developed, but, as in *M. sikimensis*, there is also an extra postero-internal angle on  $m^1$ , though rather smaller than in that species.  $M^3$ , in the single specimen, almost exactly as figured by Blasius in his *M. "campestris"* (fig. 208, p. 375), a rudimentary fourth external angle similarly present, and no doubt equally variable.  $M_1$  also about as in "*campestris*," though the three elements of the anterior trefoil are more nearly shut off from each other.

Dimensions of the type (measured in flesh):—

Head and body 109 mm.; tail 44; hind foot 18.5; ear 13.

Skull: condylo-basal length 26.8; condylo-incisive length 27.5; zygomatic breadth 15.5; length of nasals 7.5; posterior breadth on lips of meatus 13; height of muzzle 4.7; palatilar length 14.2; diastema 8; palatal foramina 5.7; upper molar series (crowns) 6.5.

*Hab. & Type* as above.

This species is no doubt a member of the *agrestis* group, but shows an interesting approximation to *M. sikimensis* by possessing an extra cusp on  $m^1$  as well as on  $m^2$ , no other true *Microtus* being known in which both cusps are present. It has, however, nothing of the peculiar coppery colour of *M. sikimensis*, and its bullae are much larger than is the case in that animal.

The Chinese *M. millicens*, also with an extra cusp on  $m^2$ , as in *M. agrestis*, is in all other respects quite a different vole, and in no way nearly allied to the present species.

## 27. *Microtus (Stenocranius) tianshanicus*, Büchn.

♂. 210. Great Altai, eastern slopes (Suok). 7000'.

♂. 221. Great Altai East (Chagan Kol). 8000'.

♂. 222, 223. Great Altai West (Kran Valley). 8000'.

♂. 284; ♀. 285, 286, 287, 288 (young). Barlik Mts. S. N.W. Dzungaria. 6000'.

The Altai specimens are rather smaller than examples from the Thian Shan, with which the Barlik specimens agree.

There is, however, a puzzling variation in size in the skulls of the members of this group, and much further material will be needed before the species can be satisfactorily distinguished.

### 28. *Microtus socialis*, Pall.

♂. 230. Steppe south of Tarbagatai Mts., Dzungaria. 2000'.

### 29. *Alticola worthingtoni*, Mill.

♀. 258. Bogdo-ola Mts., S.E. Dzungaria. 6000'.

♂. 315, 316, 317. S. Muzart Valley, Thian Shan. 7000'.

The Muzart Valley is close to the original locality of the species, the Kok-su Valley, Thian Shan. The Bogdo-ola Mts. are some 500 miles further eastwards in the latter chain.

All the specimens agree closely with the typical series.

### 30. *Alticola* sp., Miller.

♂. 327, 328, 330, 331, 332, 333, 334. Karakoram Mts., N. side, Chinese Turkestan. 9000-10,000'.

Mr. Gerrit Miller has been good enough to examine the specimens of *Alticola* obtained by Mr. Carruthers on the Karakoram Mts., and finds them to be a distinct species allied to *A. albicauda*. No. 333 (B.M. no. 12. 4. 1. 120) is the type.

### 31. *Lagurus luteus*, Eversm.

♂. 251; ♀. 252. E. of Gu-tschen, S.E. Dzungaria.

The occurrence of this interesting species in Dzungaria gives a striking instance of the penetration of Kirghiz species into Chinese territories through the gap in the mountain-chain just south of the Tarbagatai range.

It appears to me that the *Lagurus* group is amply worthy of separate generic rank, its general characters, lemming-like appearance, and especially its peculiar  $m_3$  making it readily distinguishable from all other voles.

And, further, I would separate as a special subgenus the American members of the group from the Old World ones, on the ground of their rather less lemming-like form, longer tails, and the possession of only four prisms in  $m_3$ . This subgenus might be called *Lemmiscus*, with *Lagurus* (*Lemmiscus*) *curtatus*, Cope, as its type, the other known species being *L. pauperrimus*, Cooper, and *L. pallidus*, Merr.

32. *Lagurus lagurus altorum*, subsp. n.

♀. 271. Barlik Mts., N.W. Dzungaria. 6000'. 17th June, 1911. B.M. no. 12. 4. 1. 123. Type.

♀. 305, 306. Tekes Valley, Thian Shan. 6000'.

Size rather larger and colour greyer than in true *lagurus*.

Colour above between smoke-grey and drab-grey, the three specimens all much greyer than examples of *lagurus* from the Lower Volga and Ural. Below buffy whitish. Dorsal lines well marked.

Dimensions of the type (measured in flesh) :—

Head and body 100 mm.; tail 14; hind foot 15; ear 5.

Skull: condylo-basal length 24.2; condylo-incisive length 24.1; zygomatic breadth 14.7; nasals, length 6.5; inter-orbital breadth 3.1; palatilar length 12.7; diastema 7.1 palatal foramina 13; upper molar series (crowns) 6.

*Hab. & Type* as above.

All the striped lemming-voles of the high lands of Central Asia will probably be found to belong to this greyish form, the true *lagurus* being a native of the flat regions westward as far as the Lower Volga.

33. *Lemmus obensis*, Bts.

♂. 174. Syansk Mts., 100 miles W. of Lake Baikal. 2200'.

34. *Ellobius tancrei*, Blas.

♂. 216, 217, 218, 220; ♀. 219. Chagan Kol Valley, Great Altai. 7000'.

♂. 224, 225, 226. Kran Valley, Great Altai West. 2900'.

35. *Ellobius albicatus*, sp. n.

♂. 235; ♀. 236. S.E. Hami Mts., N.E. Chinese Turkestan. 6000'.

Like *E. tancrei*, but the whitening of the sides and belly even more prominent. Skull larger throughout.

Size rather larger than in the Altai specimens of *E. tancrei*. Fur very fine and soft; hairs of back (March) about 7.8 mm. in length. Face darkening, well marked, slightly more so than in *E. tancrei*. Buffy colour of upper surface about as in *E. tancrei*, but its extent more restricted, confined absolutely to the back, the line of demarcation passing along high up on the sides. Sides and under surface broadly washed with whitish, more strikingly contrasted than in other species. Tail rather more prominent than usual, its hairs blackish.

Skull on the whole similar to that of *E. tancrei*, but larger throughout, the zygomata more widely expanded. Interparietal narrow, strap-shaped. Supraoccipital edge directly transverse, not bowed forwards in centre. Anteorbital foramina more open than in *tancrei*, the space between them greater, and their outer edges more slanted outwards.

Incisors large and heavy, their points slightly less thrown forwards than in *E. tancrei*. Molar series longer.  $M^3$  complicated, as in *E. tancrei*, exceeding Büchner's fig. 11 in this respect.

Dimensions of the type (measured in flesh) :—

Head and body 131 mm. ; tail 20 ; hind foot 23.

Skull : condylo-basal length 3.3 ; condylo-incisive length 3.5 ; zygomatic breadth 2.4 ; nasals 8.7 ; interorbital breadth 5.6 ; interparietal  $1.9 \times 6$  ; distance between outer corners of anteorbital foramina 10.6 ; palatilar length 18.2 ; diastema 11.7 ; palatal foramina 4.1 ; upper molar series, crowns 7.7, alveoli 8.2.

*Type.* Old female. B.M. no. 12.4.1.136. Original number 236. Collected 27th March, 1911.

This fine *Ellobius* may be distinguished from its only close ally, *E. tancrei*, by its size and the other characters given above. Its locality is rather peculiar, as the Hami Mts. are at the eastern end of the Thian Shan chain, which is elsewhere inhabited by quite a different form, while the allied *E. tancrei* occupies the western end of the widely separated Altai chain.

### 36. *Ellobius cœnosus*, sp. n.

♂. 307, 308, 309, 310. Muzart Valley, Thian Shan. 8000'.

A large species with muddy-coloured underside and squared interparietal.

Size large, alone exceeded—and that but slightly—by *E. albicatus*. Hairs of back about 8 mm. in length. General colour above deep buffy ; sides and under surface washed



with dull soiled buffy, conspicuously different from the whitish tone occurring in *E. tancrei* and *albicatus*. Facial darkening medium, less extended than in *E. fusciceps*. Tail quite short, its longer hairs buffy.

Skull large, rounded. Anteorbital foramina narrow, their outer edges more vertical than in *E. albicatus*. Interparietal more nearly square than in other species, their antero-posterior diameter greater and their transverse less. Palatal foramina rather shorter than in *E. albicatus*.

Incisors heavy, thrown forward as in *E. tancrei*, more so than in *E. fusciceps*. Molar series rather shorter than in *E. albicatus*.  $M^3$  fairly uniformly of the shape and complexity shown in Büchner's figures 9 to 11.

Dimensions of the type (measured in flesh):—

Head and body 120 mm.; tail 15; hind foot 21.

Skull: condylo-basal length 33.6; condylo-incisive length 35.6; zygomatic breadth 24; nasals 9; interorbital breadth 6; interparietal  $3.3 \times 6.5$ ; distance between outer corners of anteorbital foramina 9.5; palatilar length 18.5; diastema 12; palatal foramina 3.2; upper molar series, crowns 7.5, alveoli 8.1.

*Type.* Adult male. B.M. no. 12. 4. 1. 139. Original number 309. Collected 31st August, 1911.

Its dark-coloured under surface and squared interparietal will distinguish this *Ellobius* from *E. albicatus*, the only other species which equals it in size.

Two examples from the Tekes Valley, which opens into the Muzart Valley, collected by K. Wache in 1904, also seem to be referable to *E. canosus*, though their interparietals are not quite as in Mr. Carruthers's series. No doubt it will be found to be widely spread over the western part of the Thian Shan.

### 37. *Ellobius fusciceps ursulus*, subsp. n.

♂. 290; ♀. 289, 292. Barlik Mts. (S. side), N.W. Dzungaria. 7000'.

Similar to true *fusciceps* in essential characters, but the general colour decidedly darker, the back "broccoli-brown" scarcely tinged with buff, instead of the uniform pale "pinkish buff" of the Samarkand form. Under surface also more muddy coloured.

Skull apparently not differing in any important respect from that of *fusciceps*, though the incisors are perhaps a little stouter, looking disproportionately heavy for the size of the skull.

Dimensions of the type (measured in flesh) :—

Head and body 102 mm.; tail 14; hind foot 21.

Skull : condylo-basal length 30·2; condylo-incisive length 32·5; zygomatic breadth 21·6; interparietal  $2·4 \times 7·4$ ; palatilar length 16·3; upper molar series, crowns 6·7.

*Hab.* As above.

*Type.* Old male. B.M. no. 12. 4. 1. 141. Original number 290. Collected 23rd June, 1911.

In spite of the considerable difference in locality, I can find no cranial difference of importance between the Barlik *Ellobius* and that of Samarkand. But the colour-difference is so uniformly constant throughout the two series that I think it should be recognized by giving a special name to the present form.

Besides those obtained by Mr. Carruthers, the following two forms of *Ellobius* would seem to deserve description :—

*Ellobius kashtchenkoi*, sp. n.

Size almost as in *E. talpinus*. Colour dark, essentially as in the darker specimens of *E. cœnosus*. Head not heavily blackened. Back dull cinnamon, sides rather more buffy : under surface washed with "wood-brown."

Skull, although smaller, shaped about as in *E. cœnosus*, the interparietal similarly extended antero-posteriorly, though its anterior edge is more evenly convex forwards.

Molar series much shorter than in *E. cœnosus*. *M*<sup>3</sup> small, quite simple, cylindrical or with a slight concavity only on its inner side.

Dimensions of the type (measured in skin) :—

Head and body 110 mm.; hind foot 21.

Skull : condylo-basal length (c.) 30·5; gnathion to basilar suture 24·5; zygomatic breadth 21·6; nasals 7·6; inter-orbital breadth 5·2; interparietal  $4 \times 7·8$ ; palatilar length 16·6; diastema 11; palatal foramina 3·7; upper molar series, crowns 6·5, alveoli 7·2.

*Hab.* Lokotj, 60 kil. west of Smeinogorsk, Tomsk Government, Siberia.

*Type.* Young adult male. B.M. no. 9. 9. 1. 7. Collected 12th June, 1900. Received in exchange from the Tomsk Museum.

This species is externally very similar to *E. cœnosus*, but is at once distinguished by its shorter tooth-row and its simple *m*<sup>3</sup>, which is less complicated than in other Central Asian *Ellobius*.

I have named it in honour of Prof. N. Th. Kashtchenko, of the Tomsk Museum, to whose kindness we are indebted for the specimen and in whose many valuable papers so much of our knowledge of Central Asian small mammals is contained.

*Ellobius talpinus transcaspiae*, subsp. n.

Size and other essential characters of true *talpinus*, but the colour markedly bicolor as in *tancrei* and *albicatus*, the sides and under surface washed with white. Head scarcely darkened.

Skull as in *talpinus*.  $M^3$  between Büchner's figures 4 and 5.

Dimensions of the type (measured in skin) :—

Head and body (c.) 103 mm.; hind foot 21·5.

Skull: nasal tip to back of interparietal 24; zygomatic breadth 20·7; nasals 7·5; interorbital breadth 6; interparietal  $3 \times 6·6$ ; palatilar length 15; diastema 10·2; upper molar series (crowns) 6·8.

*Hab.* Transcaspia. *Type* from "Sultan-Bent." A second specimen obtained by the same collector at Aschabad.

*Type.* Adult female. B.M. no. 94.8.7.16. Collected by T. Bary. Received in exchange from the Branicki Museum, Warsaw.

The Transcaspian *Ellobius* has the characteristic contrasted bicolor coloration of *E. tancrei*, with the cranial and dental characters of *E. talpinus*. Eversmann's *E. rufescens* would seem to be simply the rufous Astrachan form of *talpinus*, the sides and under surface not specially whitened. From *E. intermedius*, Scully (if different from *E. fuscicapillus*, Blyth), it is distinguishable by its less complicated  $m^3$ .

38. *Sicista betulina*, Pall.

♂. 154. 100 miles S.E. of Minnusinsk, Upper Yenisei. 1000'.

♂. 182. Syansk Mts., 100 miles west of Lake Baikal. 4000'.

39. *Jaculus telum*, Licht.

♀. 264. Barlik Mts., N.W. Dzungaria. 2500'.

40. *Allactaga saltator*, Eversm.

♂. 209 (young adult). Suok, eastern slope, Great Altai. 7500'.

41. *Allactaga elater dzungariæ*, subsp. n.

♀. 250 (old). 100 miles east of Gu-tschen, S.E. Dzungaria. 4000'. 1st May, 1911. B.M. no. 12. 4. 1. 148.  
*Type.*

Similar to true *elater*, as represented by specimens from Djarkent, but darker in colour, the dorsal area approximately "drab," not pale buffy as in *elater*. Under surface more washed with buffy.

Incisors more slender and rather more thrown forward than in *elater*. Bar below anteorbital foramen much narrower. Palate with the posterior palatal foramina much larger, extending from the middle of  $m^1$  to the back of  $m^2$ , the transverse bridge separating them from the anterior foramina consequently much narrower. Other cranial characters as in *elater*.

Dimensions of the type (measured in flesh):—

Head and body 87 mm.; tail 164; hind foot 52; ear 34.

Skull: occipito-nasal length 27; condylo-incisive length 26.2; zygomatic breadth 20; breadth of brain-case 15.5; vertical thickness of lower anteorbital bar 1.3 (1.8 in *elater*); palatilar length 14.6; anterior palatal foramina 5.5; posterior palatine foramina 2.2; bridge between them 1.3; upper tooth series, exclusive of premolar, 4.2.

*Hab. & Type* as above.

42. *Ochotona dauurica altaica*, Thos.

♂. 205; ♀. 201, 203. Atchit Nor, N.W. Mongolia. 4500'.

♂. 211, 213; ♀. 212, 214. Suok, E. slopes of Great Altai. 7000'.

No. 205 (B.M. no. 12. 4. 1. 149) the type.

Described Ann. & Mag. Nat. Hist. (8) viii. p. 761, December 1911.

43. *Ochotona macrotis*, Günth.

♀. 335, 336. N. side of Karakoram Mts., Chinese Turkestan. 13,000–14,000'.

44. *Ochotona (Ogotoma) pricei*, Thos.

♀. 207, 208. Mts. W. of Atchit Nor (Kobdo Basin), Mongolia. 6700'.

♂. 215. Suok, eastern slope of Great Altai. 8000'.

No. 208 (B.M. no. 12. 4. 1. 159) the type.



Described Ann. & Mag. Nat. Hist. (8) viii. p. 760, December 1911.

At Mr. Carruthers's suggestion this distinct Pika has been named in honour of his companion Mr. M. P. Price.

45. *Ochotona* (*Ogotoma*) *hamica*, sp. n.

♂. 242, 243, 244. ♀. 239, 240, 241. N. Hami Mts., eastern end of Thian Shan range, Chinese Turkestan. 7500'.

Size as in *O. pallasi*. General colour above of head and body uniform pale drab, decidedly paler than Ridgway's "drab," but not quite his "écru-drab." Under surface broadly washed with paler drab, more or less tinged on neck and middle line of chest with buffy. Ears drab, a tuft at their notch whitish drab; their proectote brownish, rest of ectote slaty greyish; entote drab, with a brown line passing along parallel to the edges, which latter are whitish. An indistinct cream-buff patch behind each ear. Rump tinged with pinkish buff. Hands and feet cream-buff, tending towards pinkish buff on the centre of the metapodials.

Skull very similar to that of *O. pallasi*, but the posterior nasal region is broader, the nasals being more parallel-sided, the interorbital region is not so remarkably constricted, the palatal bridge is narrower, and the bullæ are larger. The auditory meatus is also larger; but the type of *pallasi* is not quite perfect in this respect, so that the différencé, if any, cannot be judged with accuracy.

Dimensions of the type (measured in flesh):—

Head and body 179 mm.; hind foot 33 (range 32.5–34); ear 23.

Skull: occipito-nasal length 50.5; condylo-incisive length 47.3; zygomatic breadth 25; nasals 16.7; least breadth between anteorbital foramina across back of nasals 7.2; interorbital constriction 4.1; parietal breadth 20.2; greatest posterior breadth, on tympanics 25.5; palatilar length 19.2; palatal foramina 9; breadth of palatal bridge 1.8; upper cheek-tooth series (alveoli) 9.9.

*Hab.* as above.

*Type.* Adult male. B.M. no. 12. 4. 1. 163. Original number 243. Collected 5th April, 1911.

In this animal, of which Mr. Carruthers has sent an excellent and remarkably uniform series, it is almost possible to identify the *Ochotona pallasi*, Gray (*Lagomys ogotoma*, Waterh.), which, based on B.M. no. 45. 4. 21. 5, still remains a stumbling-block to the worker in this group, owing to its having no exact locality.

But the Hami Pikas differ so constantly from it in the cranial characters above described, that they clearly cannot be referred to it; and as there is no indication of intergradation I cannot now call *hamica* a subspecies of *pallasi*, although this may possibly prove hereafter to be the proper relative position of the two forms.

Externally I can find no difference between the two animals which might not be explainable as due to the deteriorated condition of the type.

Mr. Carruthers informs me that there are no Pikas in the main Thian Shan range, and from the decided Altai relationship of the Hami Mts. in other respects, I think it probable that, when certainly identified, *O. pallasi* will prove to be an inhabitant of the Altai area.

#### 46. *Ochotona (Pika) alpina*, Pall.

♂. 189, 190, 191; ♀. 192, 193. Tannu-ola Mts., N.W. Mongolia. 6000–8000'.

♂. 197, 198, 199. Kunderlun Mts., Atchit Nor, N.W. Mongolia. 8000'.

These specimens agree very well with an example from Tyechta, on the Katun R., W. Altai, received from the Tomsk Museum, and nearly a topotype of the species.

#### 47. *Ochotona (Pika) hyperborea*, Pall.

♂. 182\* (skull only). Syansk Mts., W. of L. Baikal. 5000'.

The animal belonging to this skull measured:—

Head and body 155 mm.; hind foot 25; ear 18.5.

#### 48. *Lepus* sp.

♀. 204. Atchit Nor, N.W. Mongolia. 4500'.

♂. 229 (and extra skull). Upper Black Irtysh R., E. Dzungaria. 1000'.

♂. 256. Bogdo-ola Mts., S.E. Dzungaria. 6000'.

### XLI.—*Three small Mammals from S. America.*

By OLDFIELD THOMAS.

#### *Vampyrops zarhinus incarum*, subsp. n.

General characters as in true *zarhinus*, with which it shares the small separated incisors and all other characters of importance; but size markedly less, the skull smaller in all

dimensions, and the teeth much smaller. An indistinct dorsal stripe present.

Dimensions of the type (measured on the spirit-specimen):—

Forearm 36 mm.

Head and body 53; ear 13; nose-leaf 9.2; third finger, metacarpal 37, first phalanx 13.5; lower leg and foot (c. u.) 23.5.

Skull: greatest length 20 (22 in *zarhinus*); basal length 15.8; zygomatic breadth 12.3; mastoid breadth 10.5; palatal length 9.2; front of canine to back of  $m^3$  7; combined length of  $m^1$  and  $m^2$  on outer edge 3.2 (3.7 in *zarhinus*); front of lower canine to back of  $m_3$  7.8.

*Hab.* Pozuzo, Peru.

*Type.* Adult male. B.M. no. 12. 1. 15. 1. Collected by L. Egg. Presented by Oldfield Thomas.

*Blarina equatoris*, sp. n.

Near *B. meridensis*, but with smaller skull and teeth.

Size, as judged by skull, smaller than in *B. meridensis*, about equalling that of *B. thomasi*. Colour and length of tail absolutely as in *meridensis*, *B. thomasi* differing by its shorter tail.

Skull and teeth essentially as in *B. meridensis*, but smaller throughout.

Dimensions of the type (measured in flesh):—

Head and body 82 mm.; tail 32; hind foot 14; ear 5.

Skull: condylo-basal length 21.6; condylo-incisive length 22.5; greatest breadth 10.7; palate, length 9.5, breadth across molars 5.8; front of  $i^1$  to back of  $m^3$  9.4; combined length of  $p^4$ ,  $m^1$ , and  $m^2$  on outer edge 5.2.

*Hab.* Ecuador. Type from Sinche, Guabanda, 4000 m. Other specimens from Mt. Pichincha, Quito.

*Type.* Old male. B.M. no. 99. 9. 9. 3. Original number 136. Collected 17th December, 1898, by Perry O. Simons. Presented by Oldfield Thomas.

The three South-American species of *Blarina* are exceedingly closely allied to each other. *B. meridensis* is the largest and has a comparatively long tail; *B. thomasi* is smaller, with a short tail, and with the brain-case more abruptly swollen than in the other two; the present species agrees in shape of skull and length of tail with *meridensis*, but is even slightly smaller than *thomasi*.

*Marmosa citella*, sp. n.

Like *M. marmota*, but much smaller.

General characters, including colour, length of tail, and

all cranial features, essentially as in *M. marmota*, but size conspicuously less. Ears larger, at least in proportion to general size. Bases of hairs of under surface white, or rather cream-buff, throughout, a narrow line of hairs along the flanks having slaty bases in *marmota*. Muzzle of skull conical, not contracted in front of the orbits.

Dimensions of the type (measured in skin):—

Head and body 112 mm.; tail 122; hind foot 16; ear 26.

Skull: condylo-basal length 29·8; greatest breadth 16·8; nasals  $12\cdot4 \times 2\cdot7$ ; interorbital breadth 4·7; palate length 15·7; breadth between outer corners of  $m^3$  9·2; combined length of three anterior molariform teeth 5.

*Hab.* Goya, Corrientes, Argentina. Alt. 600'.

*Type.* Adult male. B.M. no. 98. 8. 19. 9. Original number 10. Collected 25th July, 1895, by R. Perrens. Presented by Oldfield Thomas. Five specimens examined.

This is the *Marmosa* which I have previously\* identified as Azara's "Micouré à queue longue," the basis of Oken's *marmota* and Desmarest's *grisea*. But a study of two specimens from Paraguay (one from Sapucay and the other from Asuncion) shows that the Paraguayan form—typical of Azara's description—is decidedly larger than that from Corrientes, and I therefore now describe the latter as new.

The Sapucay specimen—a female—has a condylo-basal length of 33·7 mm., three anterior molariform teeth 5·5, and other measurements in proportion. Ears, however, only 25 mm.

## XLII.—Notes on *Fossorial Hymenoptera*.—VIII.

By ROWLAND E. TURNER, F.Z.S., F.E.S.

### *On some new Species from Africa.*

THE types of the species described below are all in the British Museum. Several of the species are from the material collected for the African Entomological Research Commission by Mr. S. A. Neave, and others from the fine collection made in the Mid Zambesi districts by the late Mr. Oscar Silverlock.

\* Ann. & Mag. Nat. Hist. (6) xiv. p. 184 (1894), and (7) x. p. 158 (1902).



Family *Psammocharidæ* (olim *Pompilidæ*).*Psammochares irpeæ*, Gerst.*Pompilus irpeæ*, Gerst. Monatsber. Akad. Wiss. Berlin, p. 511 (1857).

♀. Gerst., Peters, Reise n. Mossambique, Zool. v. p. 486, pl. xxxi. fig. 3 (1862). ♀.

*Pompilus pilosus*, Sm. Deser. new spec. Hymen. p. 140 (1879). ♀.*Hab.* N. Rhodesia and Nyasaland; Luangwa River and Karonga (*Neave*); Pakasa (*Silverlock*).

Evidently a common species in the Zambesi and Nyasa regions.

Family *Crabronidæ*.Subfamily *PEMPHREDONINÆ*.*Stigmus gueinzii*, sp. n.

♀. Clypeus with a strong longitudinal carina, which is continued between the antennæ and thence more finely almost to the anterior ocellus. Eyes converging a little towards the clypeus, the inner margin marked by a well-defined carina. Front concave, opaque, aciculate; vertex smooth and shining. Head much narrowed behind the eyes, the posterior ocelli very close together and as far from the posterior margin of the head as from the eyes. Antennæ inserted low down on the sides of the clypeus, very near the eyes, more than twice as far from each other as from the eyes, the flagellum very slender at the base, a little thickened to the apex, three times as long as the scape, the whole antenna longer than the head and pronotum combined, the second joint of the flagellum a little longer than the third and more than half as long again as the first. Pronotum small, the anterior angles prominent, rather indistinctly longitudinally striated, about twice as broad as long. Mesonotum strongly arched, sparsely punctured, with two longitudinal furrows on each side, the inner one reaching from the anterior margin to the middle, the outer one very short and not reaching the margin, the space between the inner furrows marked with two obscure longitudinal carinae. Scutellum with a transverse, longitudinally striated depression at the base, otherwise smooth and shining; post-scutellum very delicately and obscurely longitudinally striated. Median segment reticulate; a depressed longitudinally striated space at the base, very short and broadly rounded posteriorly, a small triangular, transversely striated

space enclosed by low carina reaching from the apex of the depression more than halfway to the apex of the segment. Abdomen smooth and shining, the petiole as long as the thorax without the median segment. The recurrent nervure is received at the middle of the first cubital cell. Black; the mandibles and the posterior angles of the pronotum whitish; scape beneath, the five basal joints of the flagellum, tegulae and legs, except the coxae, testaceous brown, darkest on the femora. Wings hyaline, nervures dark testaceous.

Length 4-5 mm.

*Hab.* Durban, Natal.

Two specimens.

*Psenulus rubrocaudatus*, sp. n.

♀. Clypeus covered with short greyish pubescence, the anterior margin almost straight, with two small teeth in the middle. Head shining, very minutely punctured, a low longitudinal carina from the anterior ocellus joining a strongly elevated carina between the antennae, a transverse carina extending to the eyes below the antennae, but very much nearer to them than to the base of the clypeus. Eyes separated on the front by a distance equal to about one and a half times the length of the scape. Antennae inserted nearer to the eyes than to each other, separated from the base of the clypeus by about one and a half times the length of the clypeus; the first joint of the flagellum about half as long as the second, which is half as long again as the third, the apical joints thickened, the penultimate joint and the preceding one broader than long; the whole antenna not exceeding in length the thorax without the median segment. Anterior margin of the pronotum raised. Thorax sparsely and finely punctured, a vertical groove on the mesopleurae below the anterior wings. Median segment rugose; the basal area short, longitudinally striated, more coarsely in the middle than at the sides, produced at the apex and continued in a deep, transversely striated longitudinal groove reaching to the apex of the segment. Abdomen smooth and shining, the petiole longer than the thorax without the median segment, the pygidial area not defined. First recurrent nervure interstitial with the first transverse cubital nervure, or in one specimen received close to the base of the second cubital cell, the second received by the third cubital cell close to the base. Second cubital cell less than half as long as the third on the radial nervure.

Black; the mandibles at the base, scape and seven basal joints of the flagellum, tegulae, anterior and intermediate tibiae, tarsi, and femora at the apex, and the two apical abdominal segments ferruginous. Wings hyaline, iridescent, nervures black.

Length 9 mm.

*Hab.* Natal.

Described from four specimens.

Very distinct from *capensis*, Brauns, in which the antennae are much longer and the apical segments of the abdomen black.

*Psenulus latiannulatus*, Cam.

*Psenulus latiannulatus*, Cameron, Sjöstedt's Kilimandjaro-Meru Exp. ii. p. 280 (1910).

*Hab.* Kilomoto, Kilimandjaro (*Sjöstedt*); Kogia Sirikin, Pawa, North Nigeria; November (*Scott-Macfie*).

The Nigerian specimen answers well to the description except in neuration; the second abscissa of the radius being half as long as the third, and the first recurrent nervure interstitial with the first transverse cubital nervure.

Subfamily *SPHECINÆ*.

*Sphex* (*Harpactopus*) *eaton*i, Saund.

*Sphex* (*Harpactopus*) *eaton*i, E. Saund. Trans. Ent. Soc. London, p. 518 (1910).

*Hab.* Biskra, Algeria, May (*Eaton*); Makindu, British East Africa, April, 3300 ft. (*Neuve*).

East African specimens differ in having the wings darker and very strongly greenish blue, and in the absence of white pubescence on the vertex and pronotum. This is not due to abrasion, as the specimens are fresh and the pile on the mesonotum and front is not denuded.

Subfamily *PHILANTHINÆ*.

*Cerceris synagroides*, sp. n.

♀. Nigra; clypeo, fronte, mandibulis basi, scapoque fusco-ferrugineis; segmentis dorsalibus quarto quintoque flavo-aurantiacis, ventralibus quinto sextoque totis quartoque apice aurantiacis; alis fusco-violaceis; segmento ventrali secundo area basali elevata nulla; clypeo acutissime tuberculato, margine apicali transverso, quadri-dentato; oculis versus clypeum valide divergentibus; segmento mediano area basali transverse striata. Long. 30 mm.

♀. Clypeus produced into a large tubercle near the apex, the extreme apical margin nearly transverse, slightly bisinuate, with a tooth at each angle, produced in the middle into two short blunt teeth. Mandibles with a very large triangular tooth near the middle of the inner margin. Head very large, cheeks broader than the eyes, frontal carina elevated and somewhat arched, continued to the anterior ocellus. Antennæ separated from the base of the clypeus by a distance equal to about three-quarters of the length of the scape. Vertex closely and rather coarsely punctured, the front above the antennæ irregularly longitudinally striate, front below the antennæ sparsely punctured, clypeus smooth. Second joint of the flagellum as long as the first and third combined. Thorax closely and rather coarsely punctured, scutellum shallowly longitudinally depressed in the middle; basal area of the median segment rather indistinctly striated. Abdomen finely and sparsely punctured; the basal segment more than half as broad again as long; pygidial area narrow, the sides convergent towards the apex, not rounded, the base nearly four times as broad as the apex, which is very narrowly truncate, the sides of the pygidial area with a fringe of fulvous hairs. Second cubital cell nearly as long on the cubitus as the third, the petiole short.

*Hab.* Nyasaland, Mombera district, 4000 ft., 15-19 June, 1910 (*S. A. Neave*).

This splendid species is by far the largest of the genus, and in size and colour shows a remarkable resemblance to many species of the genus *Synagris*.

#### Subfamily *BEMBECINÆ*.

##### *Bembex flavicincta*, sp. n.

♂. Flavus; flagello ferrugineo, apice fusco; macula frontali utrinque supra basin antennarum, vertice, mesothorace flavo-bilineato, lineis apice fascia flava conjunctis, scutello basi, segmento mediano basi et linea obliqua utrinque, segmentis dorsalibus apice, segmentis 1-3 macula parva utrinque, segmento ventrali secundo macula magna mediana, segmentisque 4-6 basi nigris; segmento septimo ferrugineo; alis hyalinis, venis ferrugineis; femoribus intermediis subtus serratis.

Long. 20 mm.

♂. Eighth and ninth joints of the flagellum short and curved, slightly produced at the apex of the eighth joint beneath, tenth and eleventh joints slightly excavated beneath; apical joint a little longer than the penultimate, rounded at



the apex and scarcely curved. Eyes parallel on the inner margin. Basal joint of fore tarsi with six spines; intermediate femora distinctly but rather irregularly serrate; basal joint of intermediate tarsi somewhat swollen at the base but not subtuberculate; apical dorsal segment narrowly rounded at the apex. Shining, very closely and minutely punctured, more strongly on the apical dorsal segment. Second ventral segment with a low longitudinal carina; sixth with a low longitudinal carina, produced into a point at the apex, seventh with two longitudinal carinae. Claspers broadly rounded at the apex.

♀. Colours as in the male, but the black on the abdomen is rather more extensive, the black at the base of the first dorsal segment extended so as to include the two black spots. Second ventral segment shining and very sparsely punctured, a little more closely punctured on the sides. Apical dorsal segment black with a yellow spot on each side, or entirely yellow, the extreme apex ferruginous; rather coarsely punctured, narrowly rounded at the apex, the sides not sinuate, without a distinct pygidial area.

*Hab.* Pakasa, N. Rhodesia, January (*Silverlock*); Luangwa River and western shore of Lake Nyasa, July to November (*Neave*).

Though the basal joint of the intermediate tarsi is slightly swollen at the base in the male it is not subtuberculate as in *fuscipennis*, from which it also differs in the armature of the ventral segments.

*Bembex kohli*, sp. n.

♂. Niger; clypeo, labro, fronte, antennis (articulis tribus apicalibus exceptis), marginibus oculorum, tegulis, segmentis dorsalibus secundo tertioque macula laterali, quarto quintoque fascia interrupta, sexto septimoque fere totis, ventralibus 2-5 fascia angusta sinuata apicali, sexto septimoque totis, femoribus apice, tibiis tarsisque flavo-ochraceis; alis hyalinis, levissime infuscatis, venis fuscis; metatarso intermedio infra lobato-dilatato, antenarum articulis 8-10 infra spinulosis, 11-12 infra excavatis, ultimo minime curvato, apice rotundato; segmento ventrali secundo tuberculato, sexto lamina triangulari, segmento dorsali septimo lateribus valde sinuatis.

Long. 16 mm.

♀. Mari simillime colorata; segmento dorsali sexto area mediali nulla.

Long. 17 mm.

♂. Anterior tarsi not dilated, the basal joint with six spines on the outer margin. Thorax densely punctured and clothed with long greyish pubescence.

♀. Sixth dorsal segment narrowly rounded at the apex, the sides scarcely sinuate. The ochraceous marks on the second and third dorsal segments are in some specimens more developed and form narrowly interrupted bands.

*Hab.* Nyasaland, Blantyre, 3000 ft., April; Mlanji Boma, 2400 ft., May (*S. A. Neave*).

Belongs to the *fuscipennis* group.

### Subfamily NYSSONINÆ.

#### Genus PARANYSSON, Guér.

*Paranysson*, Guér. Icon. règn. anim. vii. Insect. p. 441 (1845).

*Heliorictes*, Sm. Cat. Hym. B.M. iv. p. 358 (1856).

Smith's name for the genus must sink. Whether the group should be treated as a subgenus of *Nysson* or as a separate genus is a matter of opinion. There does not seem to be any good structural distinction apart from the spine on the hind coxæ, and the absence of a spine at the angles of the median segment.

#### *Paranysson melanopyrus*, Sm.

*Heliorictes melanopyrus*, Sm. Cat. Hym. B.M. iv. p. 359 (1856). ♀.

*Hab.* Gambia (*Smith*).

A specimen from Pakasa, N. Rhodesia, in the Silverlock collection, differs from the type in the more regular striation of the median segment, the striæ not being joined by small transverse striæ, which make the segment more or less reticulate in the typical form, in which the two minute teeth at each angle of the clypeus are somewhat less distinct than in the Rhodesian specimen.

#### *Nysson heliorictoides*, sp. n.

♀. Nigra; abdomine pedibusque rufo-ferrugineis; alis fusco-violaceis.

Long. 7 mm.

♀. Front between the antennæ without a carina; a distinct carina along the outer margin of the eyes. Posterior ocelli nearly twice as far from each other as from the eyes, which diverge rather strongly towards the clypeus. Antennæ shorter than the greatest breadth of the head; the second joint of the flagellum as long as the third; the fifth joint as broad as long, as are also the other joints up to the ninth. Clypeus broad, subcarinate in the middle, slightly emarginate in the middle of the apical margin. Head and

thorax closely and rather strongly punctured; median segment very coarsely reticulate, the surface of the posterior truncation transversely striato-punctate, with a small triangular spine on each side below the level of the dorsal surface. Abdomen very finely and closely punctured, the second ventral segment flat; pygidial area almost smooth. Hind tibiae with about nine spines on the outer margin. Cubitus of the hind wing originating far beyond the transverse median nervure; second abscissa of the radius more than half as long as the first; second recurrent nervure received just before the apex of the second cubital cell; first at the apex of the first cubital cell, almost interstitial with the first transverse cubital nervure; the second cubital cell petiolate, triangular, the first and second transverse cubital nervures of equal length. Clypeus and face clothed with silver pubescence.

*Hab.* Pakasa, N. Rhodesia (*Silverlock*).

A male from Nyasaland, west of Domira Bay, probably belonging to this species, differs in having the median segment striated, not reticulate, and the seventh dorsal segment rather broadly rounded at the apex.

This species differs from typical *Paranysson* in the absence of the spine on the hind coxæ and in the presence of a small spine on the median segment. In the form of the head it closely resembles *Paranysson*.

*Nysson gregoryi*, sp. n.

♀. Nigra; antennis, prothoraco, pedibus, tegulisque ferrugineo-brunneis; clypeo, segmento dorsali primo macula magna utrinque, secundo fascia apicali subinterrupta, 3-6 totis flavo-ochraceis; alis hyalinis, venis fuscis.

Long. 9 mm.

♀. Eyes very strongly convergent towards the clypeus, the inner margin sinuate; posterior ocelli a little further from the eyes than from each other, and more than half as far again from each other as from the anterior ocellus. Antennæ inserted a little further from each other than from the eyes; first joint of the flagellum globular, second distinctly shorter than the third or fourth, all the joints except the first longer than broad. A moderately elevated longitudinal carina between the antennæ, the front higher than the base of the clypeus and narrowly truncated at the apical end of the carina. Head rather distantly and not coarsely punctured; thorax more closely and coarsely punctured; pronotum rounded at the anterior angles; scutellum not

separated by a groove from the mesonotum or postscutellum, rectangular, less than twice as broad as long; postscutellum not depressed in the middle; basal area of the median segment coarsely longitudinally striated, the surface of the posterior truncation shining, with a few indistinct transverse striae, the angles of the segment produced into stout spines directed outwards and backwards. Abdomen punctured, most strongly on the basal segment, very finely and indistinctly on the four apical segments. Second ventral segment strongly punctured and moderately convex; sixth dorsal segment distinctly margined at the sides, shallowly emarginate at the apex. Sides of the first ventral and second dorsal segments dark ferruginous. Third cubital cell almost pointed on the radius, not reaching nearer to the apex of the wing than the radius. Both recurrent nervures received by the second cubital cell, the first close to the base, almost interstitial, the second at four-fifths from the base. Spines of the hind tibiae very small and indistinct, almost obsolete.

*Hab.* Nyomps Ndogo, British East Africa (*Gregory*).

This belongs to the same group as *capensis*, Handl., and *nasutus*, Cam. The cubitus of the hind wing originates far beyond the transverse median nervure. The frontal carina is better defined than in *capensis* and the antennae inserted further apart, the posterior ocelli are more widely separated, the proportionate length of the joints of the flagellum very different, and the spines of the hind tibiae much less developed. The colour of the apical abdominal segments is also different, and the punctures on the head are larger in *capensis*.

*Nysson rufoniger*, sp. n.

♂. Niger; clypeo, scapo, flagello articulo primo, pronoto in medio interrupto, tibiis supra, segmentisque dorsalibus 1-5 fascia angusta apicali flavis; abdomine pedibusque rufo-ferrugineis; alis hyalinis, venis nigris.

Long. 7 mm.

♂. Front produced and subtuberculate between the antennae, rounded at the apex, without a carina. Antennae inserted nearer to each other than to the eyes, much thickened towards the apex; first joint of the flagellum globular, longer than the very short second joint, all the joints, except the apical one, broader than long. Eyes strongly convergent towards the clypeus, the inner margin slightly sinuate: posterior ocelli about as far from the eyes



as from each other. Head and thorax strongly punctured, the thorax more deeply and closely than the head; pronotum strongly rounded. Basal area of the median segment coarsely longitudinally striated, the surface of the posterior truncation irregularly obliquely striated, the angles produced into stout spines. Abdomen strongly but not closely punctured; second segment scarcely convex beneath, seventh dorsal segment broadly truncate at the apex; the apical margin armed with four minute teeth, the lateral margins slightly serrate. Second abscissa of the radius shorter than the petiole of the second cubital cell; the third cubital cell not reaching nearer the margin of the wing than the radial cell, second cubital cell receiving both recurrent nervures, the first at one-fifth from the base, the second close to the apex. Cubitus of the hind wing interstitial with the transverse median nervure.

*Hab.* Upper Luangwa River, N.E. Rhodesia; August 1910 (*S. A. Neave*).

#### Subfamily CRABRONINÆ.

##### *Encopognathus rugosopunctatus*, sp. n.

♀. Nigra; rugosa; mandibulis basi, scapo subtus, callis humeralibus, tibiisque anticis supra pallide flavis; abdomine ferrugineo, perlucido; alis subhyalinis, venis testaceis.  
Long. 7 mm.

♀. Mandibles excised on the outer margin; clypeus short, with a median carina. Eyes strongly convergent towards the clypeus, separated at the nearest point by a distance equal to three-quarters of the length of the scape. Checks narrow, a carina running along the outer margin of the eyes and continued on the posterior margin of the head. Ocelli in a wide triangle, the posterior pair further from each other than from the eyes; a deep oval depression between the posterior ocelli and the eyes. Head coarsely rugose-punctate; thorax coarsely rugose; pronotum with a deep transverse groove between the raised margins. Postscutellum slightly rounded at the sides, longitudinally striate-rugose, median segment depressed below the level of the postscutellum, the well-defined basal area with four longitudinal carinæ, very short, the posterior slope strongly margined and with low, irregular transverse striae, the sides of the segment almost smooth. Abdomen shining, very minutely punctured, translucent. Neuration as in Kohl's figure of *E. braueri*. Recurrent nervure received at two-

fifths from the base of the cubital cell; radial cell broadly truncate at the apex. Comb of the fore tarsi short, intermediate and hind tibiae with well-developed spines.

*Hab.* Durban, Natal (*F. Muir*).

The type of the genus, *E. braueri*, Kohl, is from Senegambia. The colour is very different, but the structure does not differ much. In the present species the fifth and sixth dorsal segments are not coarsely punctured, the punctures are slightly larger on the fifth than on the fourth: the sixth is shining, with sparse and moderately large punctures.

#### Subfamily LARRINÆ.

##### *Palarus latifrons*, Kohl.

*Palarus latifrons*, Kohl, Verh. zool.-bot. Ges. Wien, xxxiii. p. 362 (1883). ♀. Kohl, l. c. xxxiv. p. 426 (1884). ♀. Brauns, Ann. k.-k. Naturhist. Hofmus. Wien, xiii. p. 407 (1898). ♂.

*Hab.* Cape Colony; N. Rhodesia, Nangereri (*Silverlock*); S.W. shore of Lake Nyasa (*S. A. Neave*); German East Africa, Ruaha River (*S. A. Neave*).

##### *Tachytes marshalli*, sp. n.

♀. Nigra; albo-pilosa; abdomine sericeo, segmentis dorsalibus 1-4 fascia lata apicali argenteo-pilosa; alis fusco-hyalinis, venis fuscis; area pygidiali fulvo-setosa.

Long. 22 mm.

♀. Clypeus broadly subtruncate at the apex. Eyes strongly divergent towards the clypeus, separated on the vertex by a distance equal to the length of the second joint of the flagellum, which is equal to the third joint. Basal joint of the fore tarsi with seven rather stout spines. Thorax very finely and closely punctured, median segment a little more sparsely punctured. Four basal dorsal segments of the abdomen covered with short silvery pubescence, which is much closer and more shining on a broad band on the apex of each segment. Pygidial area rugosely punctured and clothed with short fulvous setae, narrowly rounded at the apex and nearly twice as long as the basal breadth. Spines of the tibiae and tarsi testaceous brown. Third abscissa of the radius a little longer than the second, but a little shorter than the first; third cubital cell less than half as long as the second on the cubitus; the distance between the recurrent nervures on the cubitus is about equal to the length of the second abscissa of the radius. The radial nervure is thickened at the base.

♂. As in the female, but the pygidial area is nearly as broad at the base as long, broadly rounded at the apex, and the third cubital cell is rather longer both on the radius and the cubitus.

*Hab.* Salisbury, Mashonaland, April (*G. A. K. Marshall*); Lilongwe district, Central Angoniland, 4000–5000 ft.; Nyasaland, between Rukuru Valley and Florence Bay, 4500 ft., June (*S. A. Neave*).

This seems to be nearly allied to *T. argenteovestita*, Cam., but is a much larger species, and differs in the details of venuration, the colour of the wings, and the number of spines on the fore tarsi.

*Gastrosericus lamellatus*, sp. n.

♀. Nigra; argenteo-pilosa: callis humeralibus, tegulis, tibiis supra coxisque anticis subtus tuberculatis flavis; mandibulis flavo-testaceis; tarsis segmentisque abdominalibus apice brunneis; alis hyalinis, venis fuscis; mandibulis longis, acutis, basi latissimis; clypeo porrecto, lamellato, apice exciso, angulis in spinis productis; facie ad basin antennarum late excisa, in spinam acutam supra basin mandibularum producta.

Long. 7 mm.

♀. Mandibles very long, slender at the apex, very broad and flattened at the base, excised on the outer margin close to the middle, not dentate, strongly curved. Clypeus in the form of a porrect lamella, longer than broad, slightly narrowed to the apex and deeply emarginate, the angles of the emargination produced into spines. Face deeply excised on each side of the clypeus as far as the base of the antennæ, produced into a long slender spine at the base of the mandibles; second joint of the flagellum half as long again as the third. Cheeks more than half as broad as the eyes, which diverge moderately towards the clypeus and are separated on the vertex by a distance about equal to the length of the four basal joints of the flagellum. Anterior coxæ produced beneath into a compressed tubercle, broad, truncate at the extremity, and longer than the trochanter; basal joint of anterior tarsi with five slender and not very long spines. Pygidial area bare, sparsely punctured, about twice as long as the breadth at the base; median segment with a carina from the base not reaching the apex. The two recurrent nervures unite just before joining the cubitus, in some specimens just at the junction. The first abscissa of the radius is less than twice as long as the second.

*Hab.* Pakasa, Zambesi River, January (*Silverlock*).

This species is easily distinguished by the extraordinary structure of the mandibles, clypeus, face, and anterior coxæ. These characters are present in both sexes, the male only differing in the lesser breadth of the cheeks. The venuration does not differ appreciably from that of other species of the genus.

*Gastrosericus silverlocki*, sp. n.

♀. Nigra, argenteo-pilosa; mandibulis fusco-ferrugineis; tibiis extus tegulisque pallide flavis; callis humeralibus flavo-marginatis; tarsis brunneis; coxis anticis apice spina setiforme armatis; clypeo apice latissime rotundato; alis hyalinis, venis fusco-ferrugineis.

Long. 8 mm.

♀. Eyes strongly divergent towards the clypeus, separated on the vertex by a distance not exceeding the length of the two basal joints of the flagellum, and not separated from the posterior margin of the head; the cheeks narrow, less than half as broad as the eyes. Second joint of the flagellum a little less than half as long again as the third. Front with a narrow longitudinal furrow reaching the anterior ocellus. Thorax very closely and distinctly punctured; median segment very fairly rugulose, half as wide at the apex as at the base, with a carina from the base not reaching the apex, the posterior truncation with a median sulcus. Abdominal segments with broad apical bands of silver pile which extend along the sides of the segments to the base. Pygidial area shining, without punctures, narrow, fully twice as long as the breadth at the base and almost pointed at the apex. The recurrent nervures unite just before the junction with the cubitus; second abscissa of the radius slightly variable in length, but never less than half as long as the first. Basal joint of fore tarsi with five long and slender spines. Abdominal segments brown at the apex beneath the pile.

*Hab.* N. Rhodesia, Pakasa (*Silverlock*); Upper Luangwa River; Niamadzi River (*Neave*).

This differs from *lamellatus* and *capensis*, Brauns, in the closer approximation of the eyes on the vertex, from *lamellatus* in the absence of the striking characteristics of the head and anterior coxæ, and from *capensis* in colour of the abdomen. It also differs in colour from *oraniensis*, Brauns, and *karooensis*, Brauns. In the descriptions of the last two species there is no mention of the distance between the eyes on the vertex, which I think Dr. Brauns would have noticed



had the species differed markedly from *capensis* in this respect. From the description of *karooensis*, I should judge that it is more nearly allied to the present species than either *oraniensis* or *capensis*.

*Gastrosericus attenuatus*, sp. n.

♀. Nigra, argenteo-pilosa; mandibulis (apice excepto), tibiis subtus, tarsis segmentisque dorsalibus apice testaceo-brunneis; tibiis supra tegulisque flavis; callis humeralibus flavo-marginatis; alis hyalinis, subiridescentibus, venis fusco-ferrugineis; clypeo apice subtruncato vel subemarginato.

Long. 7 mm.

♀. Very near *G. silverlocki* described above, but differs in the clypeus, which is subtruncate and very shallowly emarginate at the apex; in the slenderer form; the median segment is three times as wide at the base as at the apex, only twice as wide in *silverlocki*, the first abscissa of the radius is three times as long as the second, and the eyes are a little more widely separated on the vertex, though much nearer in this character to *silverlocki* than to *lamellatus* and *capensis*. The median segment shows indistinct transverse striæ near the middle.

*Hab.* Volta River, Gold Coast (*G. C. Dudgeon*).

XLIII.—*New Species of Heterocera from Costa Rica*.—XV.  
By W. SCHAU, F.Z.S.

Geometridæ.

*Ophthalmophora phrynearia*, sp. n.

♀. Palpi and head grey-brown. Thorax and abdomen brownish grey, the latter with fine, white, segmental lines. Fore wings whitish thickly mottled with greyish brown, less so on costa; inner margin white from one-third from base, expanding gradually to tornus, where it is faintly shaded with yellowish; a faint dark brown line on discocellular; a subterminal dark brown vertical shade, not reaching costa, nor extending on white inner margin. Hind wings: base dark grey-brown, followed by a white line irrorated with silver; space beyond reddish buff, broadly clear on costa, otherwise thickly covered with brownish-grey striæ below vein 4 to termen; outer space above vein 4 clear grey-brown, containing between veins 6 and 7 a large black ocellus, edged

with buff, and containing a circle of silvery lilacine scales; the margin apically to vein 4 broadly creamy white, with silvery scales beyond ocellus, near costa, and on termen above vein 4; some faint silvery spots from vein 4 to anal angle. Underneath white: fore wings with outer margin broadly fuscous from costa to vein 2.

Expanse 31 mm.

*Hab.* Tuis, Carillo.

*Ophthalmophora uncinata*, sp. n.

♀. Head and thorax grey. Abdomen buff-grey, with pale segmental lines. Fore wings greyish, with lilacine white striae: the costa buff-white; a white space on inner margin from one-third from base and not reaching tornus, its fore edge expanding to vein 2, then upbent to just above 4, its outer edge curved and shaded with pale yellow, the whole outlined by a brownish shade; above the hook a vague triangular paler shade on costa; outer space from veins 4-6 also shaded with brown. Hind wings: base greyish brown, followed by a broad silvery white shade, then in and above cell to beyond middle of wing by an ochreous-buff shade; below cell and fold to termen whitish thickly striated with dark grey, and an interrupted silvery marginal line; outer space above fold dark grey, with a short reddish-brown streak close to vein 6, and a large ocellus above it, the ocellus black, containing a metallic ring, and circled with whitish buff; large clusters of metallic scales at costa, beyond ocellus, and terminally above vein 4, above which the termen to costa is broadly creamy white. Underneath white, the outer margin of fore wing broadly fuscous, narrowing at tornus.

Expanse 30 millim.

*Hab.* Tuis.

Near *O. molpodiu*, Dr.

*Ellopia punctularia*, sp. n.

♂. Palpi fuscous. Head yellow. Body yellowish buff. Wings bone-colour. Fore wings irrorated with black points, suffusing in places and forming small fuscous patches, especially antemedially and postmedially on costa, and postmedially from veins 2-4, where the veins are shortly streaked with black; base of costa fuscous. Hind wings with fewer black spots, and short streaks postmedially on veins. Underneath slightly darker, the markings similar.

Expanse 27 mm,

*Hab.* Cartago.

*Ellopia irrorata*, sp. n.

♂. Similar to *E. punctularia*. Fore wings: the base suffused with fuscous; an antemedial, almost medial, curved thick fuscous line; a heavy fuscous shade on discocellular, suffusing with postmedial at vein 3; postmedial thick, fuscous, slightly indented from vein 4 to just below 3. Hind wings: a well-marked postmedial line, angled at vein 4, divided by a pale line from costa to vein 3.

Expanse 28 mm.

*Hab.* Juan Vinas.

*Ellopia vicinaria*, sp. n.

♂. Palpi grey. Frons brown. Vertex yellow. Thorax dark grey. Abdomen white. Fore wings whitish bone-colour irrorated with fuscous spots and points, especially antemedially, forming a confused shade; a black spot on discocellular; a postmedial line, remote and thickest on costa, indented from vein 5 to inner margin. Hind wings white; a black discal point; some scattered pale brownish striae. Underneath white, the markings similar.

Expanse 30 mm.

*Hab.* Turrialba.

*Thysanopyga commendata*, sp. n.

♂. Palpi and head brown, slightly reddish. Collar, thorax, and abdomen fuscous grey; anal hairs light reddish brown. Fore wings: costal margin and base buff-grey crossed by black striae; the extreme costa tinged with reddish; an antemedial thick, velvety, dark reddish-brown line across cell, inset below cell to inner margin; medial space fuscous grey with indistinct black striae; a fine dark reddish-brown medial line partly shaded with buff-brown; a small black spot on discocellular edged with white; outer line dark reddish brown incurved from vein 8 to 7, again from 7 to 2, forming a lunule from 2 to submedian, where it is angled and indented on inner margin, faintly edged with greyish buff; space beyond outer line purplish brown, with traces of an irregular subterminal black shade; a marginal white line before apex to termen at vein 6, and a black spot at apex; inner margin from near base with very long hairs; terminal white points. Hind wings brown, shaded with fuscous grey on termen near angle; a few darker brown striae; a fine dark medial line and indistinct postmedial line; a white discal point. Underneath dull greyish brown,

with slightly darker marginal shades; black discal points; a white apical spot and tufts of long brown-black hairs on inner margin of fore wing.

Expanse 31 mm.

♀. Body and wings dull grey; white discal points. Fore wings: an antemedial dark red-brown line, thickest below cell; outer line defined by a dark red-brown space following it, the inner edge following the shape of outer line in male, its outer edge reaching the white line before apex, inbent at termen and vein 6 to below 5, then incurved and outwardly dentate to below vein 3, below which it is sinuous and partly edged with whitish. Hind wings: a fine dark brown antemedial line; a less distinct postmedial line and a vague subterminal shade. Underneath dull brownish grey, the outer margins broadly reddish brown; the white apical spot as in ♂.

Expanse 32 mm.

*Hab.* Cachi, Tuis, Juan Vinas.

*Melanolophia funebris*, sp. n.

♀. Palpi, head, and thorax mottled buff and brown, the collar somewhat darker. Abdomen buff-brown, with some darker irrorations and traces of a dorsal line. Fore wings: costa for two-thirds from base ochreous with dark striae; base greyish with dark striae; antemedial space fuscous, narrow on costa, expanding below cell, crossed by an indistinct curved whitish line, and another line outwardly on inner margin; medial space wide on costa, narrowing to inner margin, greyish in cell, white beyond and below cell, thickly striated with fuscous; outer third fuscous, with irregular white patches at apex and termen at vein 3, also traces of a subterminal white line and more distinct terminal line; all the markings interrupted by an ochreous shade along median and vein 3 to near termen, expanding close to cell from veins 2-4; cilia black, except between veins 3 and 4 and at apex, where it is white. Hind wings fuscous grey, the outer margin broadly darker, with traces of fine dark transverse lines; cilia white. Wings below fuscous grey, the outer margins broadly darker, except from vein 3 to tornus on fore wing; black discal spots, fore wing with white patches beyond cell, at apex, and terminally at vein 3.

Expanse 43 mm.

*Hab.* Juan Vinas.



*Ischnopteryx parvula*, sp. n.

♂. Palpi, head, collar, and thorax dark greyish olive. Abdomen above similar with some brown irrorations; a black dorsal line at base, and black dorsal points on fourth and fifth segments. Fore wings greyish olive, striated with black except adjoining lines; a black spot at base of cell; a fine black antemedial line, forming an outcurve above and below submedian, the curves inwardly edged with white; the outer line from just beyond middle of costa fine, black, outbent to vein 1, then lunular and inbent to inner margin, the lunules outwardly filled with white; a faintly brownish shade follows this line; a vague subterminal pale shade, whitish and dentate near costa, preceded and followed by black streaks near apex; a terminal black line; cilia pale pinkish with dark blotches. Hind wings fuscous: a fine black postmedial line; cilia olive-brown tipped with white. Underneath bone-colour, thinly striated with dull dark grey; the outer margins fuscous grey; the outer line less distinct on fore wing.

Expanse 31 mm.

♀. Fore wings: the antemedial line curved on costa, not extending below cell; the outer line interrupted, punctiform below vein 4, with the white shading barely visible; a black shade between the lines filling costa, cell, and space between veins 2 and 4, to postmedial; the subterminal line only visible near costa preceded and followed by black, a streak between veins 6 and 7. Underneath more thickly suffused with fuscous grey.

Expanse 35 mm.

*Hab.* Carillo.

*Nipteria pectinata*, sp. n.

♂. Palpi fuscous brown. Head and thorax brownish grey. Abdomen above light grey, ventrally white, with black segmental lines. Fore wings whitish grey, thinly scaled; costal margin thickly mottled with fuscous grey; a fuscous line on discocellular shaded with dark grey; some dark grey striae beyond cell, and preceding the marginal dark grey shade, which expands above vein 5 to a series of short fuscous postmedial streaks on veins. Hind wings thickly irrorated with dark grey striae, suffusing and forming a broad postmedial and marginal shade; a fuscous discal spot. Underneath similar but darker, the hind wings with striae evenly distributed to termen; the discal spot black, the post-

medial darker, and somewhat interrupted by ground-colour and striæ.

Expanse 43 mm.

*Hab.* Juan Vinas.

Can be easily distinguished from other Costa Rican species of *Nipteria* by whiter colour and longer pectinations of antennæ.

*Nelo tamfana*, sp. n.

♂. Body above black; some white irrorations on frons; a small orange-red spot medially on collar, and a large spot on shoulders; abdomen below white with segmental black lines; white streaks on legs. Wings black. Fore wings: a large reddish-orange space from near base to beyond middle, leaving costal and inner margins narrowly black. Hind wings: a large reddish-orange spot, slightly more remote from base, leaving the costa more broadly black, and with a black streak on median and vein 2; a small orange spot on costa before apex. Fore wings below with the orange space paler; a white streak at base of costa; outer margin with interspaces at apex grey-black; a white streak between veins 3 and 4. Hind wings below black-brown, the veins darker, the markings creamy white; a costal and subcostal streak at base; a streak at end of cell above median; a streak from cell to termen between 3 and 4; a spot beyond cell from 4-6; a round spot on costa before apex; a long streak above inner margin.

Expanse 24 mm.

*Hab.* Juan Vinas, El Sitio.

Near *N. chrysomela*, Btl., the underside quite different.

*Oospila eminens*, sp. n.

♂. Palpi and head lilacine brown, the former fringed with white; vertex behind, and collar in front, white; collar behind and patagia green; thorax and base of abdomen brownish buff; abdomen otherwise lilacine buff, thinly irrorated with black and with fine darker dorsal tufts; terminal segment, body laterally, and underneath white; legs streaked with roseate brown. Fore wings green; a black point on discocellular just within a buff space which extends to inner margin before middle, and to outer margin at vein 2, crossed by darker striæ, and edged with purple along green portion; a similar space terminally from vein 4 to apex, inwardly edged by a curved purplish line; a terminal purplish line from vein 2-4, and terminal brown shades from

4 to apex; the costa finely yellow. Hind wings green; some silvery white scaling at base, and a similar spot on discocellular anteriorly; a broad marginal buff-brown space from costa beyond middle to vein 4, inwardly edged by a purplish line, oblique to vein 6, then obliquely curved to vein 4 at termen; a similar smaller space at anal angle, and a narrow streak on basal half of inner margin. Wings below whitish, showing the markings of upper side in pale green and pinkish white; terminal black spots; cilia brown.

Expanse, ♂ 42, ♀ 55 mm.

*Hab.* Juan Vinas, Sitio, Laguna.

*Trygodes amphion*, sp. n.

♂. Palpi buff, laterally shaded with fuscous. Frons buff-brown shaded with fuscous. Collar fuscous shaded with reddish brown behind; some grey scaling in front and on vertex. Thorax reddish brown, the patagia shaded with lilacine buff. Abdomen lilacine buff shaded with brown. Wings lilacine brown, the lines fuscous, the spots very dark green, finely edged with black and then with buff-white. Fore wings: a large antemedial spot from median to inner margin, and an oblique fuscous line above, across cell and costa; a fuscous shade on costa at base; a large spot at end of cell, nearly quadrate, its inner edge indented; a small spot between veins 2 and 3 at cell; a series of coalescing spots beyond cell from 3-8, those between 3 and 4, and 5 and 6 smaller; a postmedial lunular line; a subterminal lunular line followed by a fuscous shade at tornus, and from below vein 4 to above 5, the termen otherwise shaded with grey, especially at apex, and crossed by a straight brownish line from 6 to 8 near subterminal; a terminal brown line, indented above vein 5 to vein 8; cilia buff-brown, divided by a fuscous line. Hind wings: a long spot across end of cell, and one below it to below vein 2; another spot beyond cell, widest between 4 and 5; lines and termen as on fore wing; some scattered dark irrorations on inner margin and between veins 4 and 6. Underneath pale brownish buff, the discal spots smaller, fuscous; lines more heavily marked; termen whiter; inner margin of fore wing whitish, and no antemedial spot.

Expanse 42 mm.

*Hab.* Juan Vinas, Tuis.

*Dithadama angulata*, sp. n.

♂. Palpi and head roseate brown; vertex grey behind;

a roseate brown fringe behind head. Tegulae, patagia, and thorax grey, a fine brownish line on latter posteriorly. Abdomen dorsally violaceous brown; an angled whitish shade at base; last two segments lilacine white crossed by a segmental brownish line; lateral tufts and underneath yellowish. Fore wings pale lilacine brown; base, costa, apex, and termen pale grey; basal space limited by a brown antemedial line, deeply incurved below cell, and containing a small brown spot on costa near base; the grey on costa medially entering cell; a large irregular, darker brown spot at end of cell; traces of a postmedial darker line, chiefly beyond cell and on inner margin; a fine dark subterminal line, irregularly outbent from costa, nearly touching a fine terminal brown line between veins 5 and 3, then incurved to inner margin, separates the lilacine brown portion from terminal space, and is followed on inner margin by an upright fuscous streak; cilia whitish grey. Hind wings: a narrow whitish-grey space at base, limited by a dark brown line; antemedial space and inner margin lilacine, irrorated with purplish brown; a medial opalescent, semihyaline space, narrowest on costa and not reaching inner margin, followed by a narrow brown shade and a very irregular dark brown postmedial line, geminate near costa; postmedial followed from costa to vein 4 by a broad slate-grey shade, which becomes narrower and paler from vein 4 to inner margin at tornus; terminal area lilacine shaded with brown and crossed by a darker brown shade, almost black from costa to vein 4; a terminal brown line; cilia yellowish white, shaded with dark brown at vein 6, where the margin is slightly produced and angled. Fore wings below roseate; apex and inner margin whitish; a marginal broad black shade from vein 3 to tornus. Hind wings below luteous; a very broad black shade on outer margin.

Expanse 32 mm.

*Hab.* Sixola.

Superficially like *D. admirabilis*, Obt.

*Dithadama delila*, sp. n.

♀. Palpi and frons dark reddish brown; vertex, collar, and thorax dark grey; abdomen grey irrorated with reddish brown. Fore wings silvery grey with darker irrorations; from middle of costa to inner margin before middle a wavy maroon-red line, inwardly edged with whitish, outwardly with reddish brown, which extends almost to outer line and is interrupted by a greyish spot on discocellular, and fuscous



grey shadings on and below costa, and between veins 2 and 4; outer line remote, fine, whitish, inwardly shaded with reddish brown, outwardly oblique from costa, with a pointed angle at vein 6, then outcurved to near termen at vein 3, and incurved to inner margin; a marginal fuscous shade from vein 6, narrowing to vein 2 and expanding below it; a terminal black line interrupted by grey points at veins. Hind wings: base narrowly grey, then reddish brown to outer line, with a fuscous-brown streak on discocellular, outwardly pale-edged; outer line maroon-red, irregular, outwardly shaded with whitish; a subterminal olive-grey shade; termen whitish, with the terminal black line as on fore wing. Fore wings below silky reddish, the inner margin white. Hind wings below whitish, with a postmedial and a subterminal reddish shade.

Expanse, ♂, 19-27 mm.

*Hab.* Sixola, Esperanza, Juan Vinas.

Near *D. adela*, Dogn.

*Hemalea punctilinea*, sp. n.

♂. Body above and wings salmon-buff; a transverse dark streak on second segment of abdomen; cilia brown with fuscous streaks at veins; a fine terminal fuscous line. Fore wings: costa fuscous; antemedial white points on veins, inwardly oblique from costa, the point nearest to it surrounded with fuscous; a black point on discocellular; a postmedial outcurved series of white points on veins, those near costa edged with fuscous; a terminal brown shade at vein 4; a fuscous spot at tornus extending just above vein 2. Hind wings: a black point on discocellular; postmedial white points faintly outcurved. Body below whitish. Fore wings below tinged with pale salmon, the apex whitish; the costa and termen narrowly fuscous; a subapical interrupted fuscous line. Hind wings below whiter, the termen more broadly fuscous; minute black discal points on both wings.

Expanse 21 mm.

*Hab.* Juan Vinas.

*Polypætes albilinea*, sp. n.

♀. Palpi, head, and thorax dark brown; abdomen fuscous brown above and ventrally; broad lateral brownish-yellow lines and sublateral black lines. Fore wings dull brown, the veins brownish yellow; a white medial line, incised just below cell at vein 2 and outangled below submedian fold; a subterminal greyish-brown shade. Hind wings thinly scaled

smoky brown-grey, the veins finely yellowish; a dull yellow space below cell from base to before middle, and not extending on abdominal fold.

Expanse 39 mm.

*Hab.* Turrialba.

*Tithraustes phaëthon*, sp. n.

♂. Palpi fuscous, the base orange. Body above black; grey lines on frons; orange scales on shoulders; a lateral white line on abdomen; abdomen below white. Fore wings fuscous, the veins paler; cell very short; veins 3 and 4 on long stalk; faint whitish streaks beyond cell from vein 3-8; before apex a whitish fascia from 4-8 cut into spots by veins. Hind wings black; a white space from base in and above cell, expanding below cell to near vein 3, and leaving outer margin broadly black, the costa very narrowly black. Fore wings below with the white markings more pronounced. Hind wings below as above, but the inner margin rather broadly white.

Expanse 34 mm.

Female differs in having only a small whitish spot beyond cell.

Expanse 42 mm.

*Hab.* Juan Vinas, Sitio, Tuis.

*Pyrалopsis damalis*, sp. n.

♂. Palpi and body above bright yellow; abdomen with a black dorsal line on third, black spots on following segments, increasing in size terminally, and separated by whitish segmental lines; a sublateral black line; ventrally creamy white. Fore wings bright yellow, the outer third olive-black crossed by buff-white veins; costa finely black; the yellow space terminating in a straight line on costal margin, outcurved below it. Hind wings deeper yellow, the outer margin black. Underneath similar, the black margin of hind wings also cut by pale veins.

Expanse 38 mm.

*Hab.* Juan Vinas.

Near *P. homalochroa*, Feld.

*Phaechlona crocearia*, sp. n.

♂. Body orange; a dorsal black line on abdomen. Fore wings fuscous brown; a bright yellow space from base to beyond middle, leaving costa finely dark, and also space

below fold, which is, however, streaked with yellow on inner margin and on submedian; a semihyaline patch on yellow space beyond cell. Hind wings bright yellow; the outer margin rather broadly black, partly interrupted by a yellow streak above anal angle. Fore wings below with yellow space extending to inner margin.

Expanse 25 mm.

*Hab.* Sixola.

*Oricia domina*, sp. n.

♀. Body and wings bright yellow; abdomen dorsally shaded with fuscous on last segments. Fore wings: a fuscous line from costa at three-fourths from base, obliquely out-curved to submedian, along which it continues to near base; terminal space brownish grey. Hind wings: the outer margin narrowly black, and narrowest at vein 4. Fore wings below: outer margin fuscous, widest on costa.

Expanse 34 mm.

*Hab.* Limon.

Near *O. truncata*, Wlk.

[To be continued.]

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XLIV.—*Descriptions of new Species of Pyralidæ of the Subfamily Pyraustinae.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from p. 336.]

(7 b) \**Nacoleia rectistrialis*, sp. n.

Head, thorax, and abdomen white; palpi above and third joint, and basal joint of antennæ black; tegulae white with black dorsal stripe; pro- and metathorax with black bands; legs with brownish stripes; abdomen with black segmental bands dorsally confluent on terminal segment. Fore wing white; the costal area black-brown; streaks on median nervure and veins beyond the cell to the postmedial white line brown; an oblique fascia from base of inner margin to vein 2 near origin; an elliptical black-edged annulus in middle of cell with traces of another below it and a discoidal lunule; the postmedial line minutely dentate, oblique from costa to vein 5, then slightly bent outwards to vein 2, then very oblique to middle of inner margin; terminal area black-brown, the cilia with a series of white points. Hind wing black-brown; a broad oblique medial white band with black

discoidal spot on it; the postmedial line minutely dentate and bent outwards between veins 5 and 2; cilia with white points on apical half, then mostly white from middle to near tornus.

*Hab.* KEY Is. (Kühn). *Exp.* 18 mm. Type in Coll. Rothschild.

(19 a) *Nacoleia ptyonota*, sp. n.

Palpi of male with the second joint angled with scales in front, the third joint with large tuft in front; hind tibiae with large tuft of scales at extremity above; fore wing on underside with fans of large scales below base of costa and in base of cell; patagia extending to well beyond metathorax.

♂. Head, thorax, and abdomen yellow strongly tinged with rufous, the vertex of head mostly white, some black hair below patagia, the anal segment of abdomen tinged with fuscous at base and extremity; palpi blackish, white at base; pectus, legs, and ventral surface of abdomen white, the fore tibiae with black bands at base and at extremity, the extremity of tarsi blackish, the mid tibiae rufous above, the tuft of scales at extremity of hind tibiae white on outer side, black on inner. Fore wing yellowish strongly tinged with rufous, the costal and terminal areas broadly suffused with red-brown; antemedial line blackish, oblique to median nervure, then erect; a black point in middle of cell and oblique discoidal bar; postmedial line blackish, bent outwards and waved between veins 5 and 2, then retracted to below end of cell and slightly excurved at submedian fold; cilia with a whitish line at base followed by a brown line. Hind wing pale yellow tinged with rufous, the terminal area broadly suffused with red-brown; an oblique blackish discoidal bar; postmedial line blackish, bent outwards between veins 5 and 2, then retracted to below end of cell and oblique to above tornus; a blackish terminal line; cilia whitish with a blackish line at middle.

*Hab.* E. PERU, Pozuzo, 1 ♂ type. *Exp.* 26 mm.

(20 a) *Nacoleia lophotalis*, sp. n.

Fore wing of male with large fold on basal third of costa on underside ending in a tuft of hair, and a fold in cell fringed with scales on underside.

♂. Black-brown; palpi pale brown, whitish at base; pectus, legs, and ventral surface of abdomen whitish; fore tibiae tinged with fuscous at extremity; anal tuft ochreous



white; wings with a cupreous gloss; fore wing with slight blackish discoidal point; both wings with fine pale line at base of cilia.

*Hab.* SINGAPORE (Ridley), 1 ♂ type. *Exp.* 26 mm.

(22 a) *Nacoleia xanthota*, sp. n.

♂. Head yellow; palpi black except at base; antennæ brown except basal joint; tegule and patagia orange-yellow, the latter brown at tips, the dorsum of thorax brown; pectus and legs yellow, the tarsi ringed with brown; abdomen dark brown slightly mixed with yellow, the extremity and base of ventral surface orange-yellow. Fore wing dark brown slightly irrorated with yellow; a yellow subbasal line from costa to vein 1; antemedial line yellow, erect, somewhat expanding at costa; a large triangular orange-yellow patch on middle of inner margin; a large quadrate orange-yellow patch on costa towards apex with the faint postmedial line arising from its lower inner edge, bent inwards below vein 3 and touching the medial patch at inner margin; a fine pale line at base of cilia. Hind wing orange-yellow; a brown spot at base of inner margin; large dark brown patches at apex and tornus, with three small spots between them on termen; cilia brown with a fine pale line at base.

*Hab.* BR. N. GUINEA, Dinawa (Pratt), 1 ♂ type. *Exp.* 22 mm.

(25 a) *Nacoleia lophophoralis*, sp. n.

*Nacoleia lophophoralis*, Wileman, Trans. Ent. Soc. 1911, p. 379, non descr.

Fore wing of male on underside with fold and fringe of hair in lower part of cell containing a tuft of very long hair from base of costa.

♂. Head, thorax, and abdomen pale ochreous brown; palpi blackish at tips; anal tuft black in male. Fore wing pale ochreous brown; antemedial line fuscous, excurved from costa to submedian fold; then oblique; a black point in middle of cell and small discoidal lunule; postmedial line fuscous, excurved between veins 5 and 2, then retracted to lower angle of cell and again excurved; a fuscous terminal line. Hind wing pale ochreous brown; a small black discoidal spot; postmedial line fuscous, bent outwards between veins 5 and 2, then retracted to lower angle of cell and oblique to above tornus; a fuscous terminal line and slight dark line through the cilia.

*Hab.* JAPAN, Fushiki (*Leech*), 1 ♂ type; SINGAPORE (*Ridley*), 1 ♂, 1 ♀. *Exp.* 28 mm.

(26 a) *Nacoleia subalbalis*, sp. n.

♀. Dark brown with a cupreous gloss: palpi black above, white below: pectus, legs, and ventral surface of abdomen white. Underside of hind wing white, the terminal area suffused with brown; a dark discoidal spot and rather diffused postmedial line excurved between veins 5 and 2.

*Hab.* W. CHINA, Moupin (*Kricheldorf*), 1 ♀ type. *Exp.* 32 mm.

(27 a) *Nacoleia foviferalis*, sp. n.

Hind wing of male with hollowed-out vesicle on underside at tornus surrounded by tufts of hair, the inner margin fringed with long hair.

Head and thorax rufous, metathorax pale; pectus and legs whitish; abdomen grey-brown tinged with rufous and with whitish segmental lines, the ventral surface whitish. Fore wing rufous with slight dark irroration in parts; antemedial line dark, erect, slightly waved, defined on inner side by semihyaline white varying in width and with a semihyaline point beyond it in cell; a triangular semihyaline patch in end of cell confluent with a rather bifid patch below the cell, both defined by blackish at sides; postmedial line dark defined by semihyaline white on outer side, most strongly towards costa and inner margin, somewhat dentate at veins 7, 6, at vein 5 bent inwards to lower angle of cell, then bisinuate to vein 1, where it is again bent inwards, forming a band with the hyaline patches in and below cell; a terminal series of dark points. Hind wing greyish tinged with rufous, especially on terminal area; a semihyaline white band defined on each side by fuscous from below middle of costa to tornus, towards which it becomes sinuous in male, which has some blackish hair on the vesicle on upperside; a dark terminal line slightly defined by whitish on inner side; cilia white with a fuscous line through them; the underside whitish tinged with brown.

*Hab.* PANAMA, La Chorrera (*Dolby-Tyler*), 1 ♀; PARAGUAY, Sapucay (*Foster*), 4 ♂ type. *Exp.* 22-24 mm.

(27 b) *Nacoleia oxiperalis*, sp. n.

♂. Fore wing with the apex produced and acute, the termen excised below apex and excurved at middle; hind

wing with the termen excurved at middle, the tornus truncate. Head, thorax, and abdomen grey-brown; palpi fuscous, white at base; tarsi pale. Fore wing dark brown to postmedial line, the terminal area grey-brown; antemedial line dark defined by whitish on inner side, slightly oblique towards costa, then straight; postmedial line dark defined by whitish on outer side, oblique from costa to vein 7, then inwardly oblique; a faint dark subterminal patch above tornus; a fine dark terminal line; cilia with dark line through them and white tips except at middle and tornus. Hind wing dark brown to postmedial line, the terminal area grey-brown with diffused dark apical patch; a dark line defined by whitish on outer side from costa beyond middle to tornus; some silvery-blue subterminal suffusion from vein 4 to tornus; cilia with a dark line through them, the tips whitish towards apex; the underside much greyer.

*Hab.* JAMAICA (*Kaye*), 1 ♂ type; W. COLOMBIA, Jiminez, 1 ♂. *Exp.* 24 mm.

(27 c) *Nacoleia excurvalis*, sp. n.

♀. Head, thorax, and abdomen dark greyish brown, the last with slight grey segmental rings; palpi blackish, brownish white at base; tarsi pale. Fore wing grey-brown with a slight reddish tinge, the medial area rather darker; antemedial line dark defined by whitish on inner side, very slightly incurved; postmedial line double filled in with whitish, oblique from costa to vein 7, excurved to vein 4, then incurved; a terminal series of slight dark lunules. Hind wing grey-brown with a slight reddish tinge; an oblique dark line defined by whitish on outer side from middle of costa to inner margin above tornus, some grey suffusion beyond it; a terminal series of small dark lunules; the underside grey.

*Hab.* GUATEMALA, 1 ♀ type. *Exp.* 32 mm.

(27 d) *Nacoleia acyperalis*, sp. n.

Fore wing with the apex acute and produced, the termen excised below it.

♂. Fulvous yellow; head, thorax, and abdomen tinged with reddish brown; palpi brown; frons blackish; fore tibiae with blackish band at extremity, the tarsi whitish. Fore wing with the costal area suffused with reddish brown; antemedial line oblique from costa to submedian fold, then

erect, brown points before and beyond it in cell: a black discoidal spot; postmedial line incurved below costa, bent outwards between veins 5 and 2, then retracted to lower angle of cell and incurved to inner margin; terminal area brown, its inner edge with sinus between veins 5 and 2; cilia with a fine yellow line at base. Hind wing with small black discoidal spot; postmedial line incurved below costa, bent outwards between veins 5 and 2, then retracted to lower angle of cell and oblique to inner margin; terminal area brown, narrowing to a point at tornus, its inner edge with a sinus between veins 5 and 2; cilia with a fine pale line at base, whitish at tips at submedian interspace.

*Hab.* NIGERIA, Old Calabar (*Crompton*), 1 ♂ type. *Exp.* 22 mm.

(30 a) *Nacoleia trichogyialis*, sp. n.

♂. Fore and mid tibiae clothed above with long rough hair; a tuft of long hair from pectus at origin of fore wing.

Orange-yellow; palpi fuscous banded with yellow; frons, thorax, and abdomen with slight fuscous markings; the hair on the fore tibiae and at base of mid tibiae fuscous. Fore wing with the costal area fuscous to beyond middle; some fuscous at base; a curved antemedial line; spots in middle of cell and on discocellulars; the postmedial line incurved beyond the cell, strongly excurved between veins 5 and 3, then retracted to lower angle of cell, connected with the antemedial line by a fascia in submedian fold and reaching inner margin just beyond middle; the terminal area fuscous, its inner edge excised at middle; cilia ochreous at apex and above tornus. Hind wing with black discoidal spot; the postmedial line strongly excurved between veins 5 and 3, then retracted to below end of cell and oblique to inner margin; the terminal area fuscous, its inner edge excised at middle; cilia grey at tips.

*Hab.* NIGER R., Warri (*Roth*): CAMEROONS (*Sjostedt*), 1 ♂ type, Ogove R., 1 ♀. *Exp.* 18 mm.

(32 b) *Nacoleia asaphialis*, sp. n.

Dull fuscous brown, female rather paler; palpi and frons blackish, the former white at base; throat white. Fore wing with traces of a nearly straight dark antemedial line; an indistinct point in middle of cell and slight discoidal lunule; both wings with an indistinct postmedial line.



straight from costa to vein 5, where it is bent outwards and minutely dentate to vein 2, then retracted to below end of cell; a rather darker line at base of cilia.

*Hab.* LOUISIANAS, St. Aignan (*Meek*), 1 ♂ type. *Exp.* 28 mm.

(33 a) *Nacoleia epipaschialis*, sp. n.

♀. Head and thorax reddish brown; palpi with the third joint black in front and behind, whitish at middle; black points behind antennæ; abdomen brown; pectus, legs, and ventral surface of abdomen whitish, the fore tibiæ brown and fuscous, the tarsi brown with slight pale rings. Fore wing pale reddish brown, slightly irrorated with dark brown; a blackish streak on base of inner margin; antemedial line represented by an oblique black bar on inner area; a triangular black spot in end of cell; an oblique black discoidal lunule with white lunule on its outer edge; postmedial line black, dentate, oblique from costa to vein 3, then obsolete; subterminal line represented by diffused obsolescent black lunules above veins 7, 6 and prominent lunules between veins 5 and 2; a terminal series of small black spots conjoined by a line; cilia ochreous white with series of slight brown spots. Hind wing pale fuscous brown, the costal area whitish; cilia whitish with a diffused dark line through them; the underside dirty white, the inner half suffused with brown.

*Hab.* S. LEONE (*Clements*), 1 ♀ type. *Exp.* 28 mm.

(35 c) *Nacoleia pervulgalis*, sp. n.

Head, thorax, and abdomen pale red-brown mixed with fuscous; palpi fuscous, whitish at base; pectus, legs, and ventral surface of abdomen whitish. Fore wing pale red-brown thickly irrorated with fuscous except on costal area; antemedial line black, obliquely excurved to submedian fold and slightly incurved at vein 1; a black point in middle of cell and oblique discoidal bar; postmedial line black, minutely waved, excurved between veins 6 and 3, then retracted to below end of cell and erect to inner margin; a terminal series of black points. Hind wing pale reddish brown thickly irrorated with fuscous; an oblique black discoidal striga; postmedial line black, excurved and minutely waved between veins 5 and 2, then retracted to below end of cell and oblique to tornus; a terminal series of black points; the underside paler, a black striga in middle

of cell and prominent discoidal lunule, the postmedial line diffused towards costa.

*Hab.* GOLD COAST (*Johnston*), 1 ♀, Kumasi (*Whiteside*), 2 ♂ type. *Exp.* 26-28 mm.

(36 a) *Nacoleia lenticurvalis*, sp. n.

♀. Head and thorax grey-brown slightly tinged with rufous; abdomen grey-brown with slight whitish segmental lines; palpi fuscous, white at base; pectus, legs, and ventral surface of abdomen whitish, the fore tibiae fuscous at extremity. Fore wing fuscous brown, the costal area slightly tinged with rufous; antemedial line fuscous, oblique from costa to submedian fold; a small black spot in middle of cell and discoidal lunule; postmedial line blackish, straight from costa to vein 3, then oblique; a terminal series of slight black points; cilia white at tips towards tornus. Hind wing fuscous brown; a faint discoidal point; postmedial line fuscous, slightly excurved between veins 5 and 2, then retracted to below angle of cell and again excurved; a terminal series of slight dark striæ; cilia white at tips between veins 4 and 1; the underside tinged with whitish.

*Hab.* VENEZUELA, Valencia, 1 ♀ type. *Exp.* 26 mm.

(36 b) *Nacoleia nitida*, sp. n.

♂. Head, thorax, and abdomen fuscous with a slight purplish gloss; palpi at base, pectus, legs, and ventral surface of abdomen whitish. Fore wing eupreous fuscous with a purplish gloss and slightly mixed with whitish to postmedial line, except on costal area; antemedial line blackish, oblique, from below costa to inner margin; a small black discoidal lunule; postmedial line blackish, excurved from costa to vein 2, then slightly bent inwards and oblique to inner margin; a fine pale line at base of cilia. Hind wing eupreous fuscous with a purplish gloss, the basal half with some whitish mixed; a small blackish discoidal spot; an oblique dark medial shade defining the pale area; a fine pale line at base of cilia which are whitish at tips; the underside with the basal half whiter, the medial shade excurved between veins 5 and 2.

*Hab.* W. COLOMBIA, Jiminez, 1 ♂ type. *Exp.* 26 mm.

(36 d) *Nacoleia perstygialis*, sp. n.

♀. Head, thorax, and abdomen black-brown; palpi below, pectus, and ventral surface of abdomen ochreous white.

Fore wing black-brown with a greyish gloss ; an indistinct, rather diffused dark antemedial line ; a discoidal spot ; a rather diffused dark postmedial line, somewhat oblique from costa to vein 3, then retracted to below end of cell ; a fine pale line at base of cilia followed by a dark line. Hind wing black-brown with a greyish gloss ; an indistinct, rather diffused dark postmedial line, oblique from costa to vein 3, then retracted to below angle of cell and oblique to inner margin above tornus ; a fine pale line at base of cilia followed by a dark line.

*Hab.* C. CHINA, Ichang (*Mrs. Pratt*), 1 ♀ type, Chang Yang (*Pratt*), 1 ♀. *Exp.* 20 mm.

(38 a) *Nacoleia fusalis*, sp. n.

♂. Head, thorax, and abdomen yellowish suffused with cupreous brown ; sides of frons yellow ; palpi white below ; pectus, legs, and ventral surface of abdomen white, the last with the terminal segments dorsally suffused with black. Fore wing yellowish suffused with cupreous brown ; an indistinct, diffused, slightly curved antemedial line ; a small blackish spot in middle of cell and slight discoidal lunule ; a rather diffused indistinct postmedial line with some yellowish before and beyond it at costa, minutely waved, excurved from below costa to vein 2, then retracted to below angle of cell ; a terminal series of black striæ ; cilia chequered fuscous and yellowish. Hind wing pale suffused with cupreous brown ; a terminal series of dark striæ ; cilia yellowish with a dark line through them ; the underside whitish with dark discoidal lunule and sinuous postmedial line.

*Hab.* C. COLONY, Transkei (*Miss F. Barrett*), 1 ♂ type. *Exp.* 24 mm.

(39 a) *Nacoleia dizona*, sp. n.

♂. Head, thorax, and abdomen grey-brown ; palpi black, white at base ; frons with white streaks at sides ; pectus and legs white, the fore tibiæ with black band at extremity ; abdomen with slight segmental lines and two more prominent bands at extremity which is blackish, the ventral surface white except last two segments. Fore wing grey-brown with slight dark irroration ; a rather diffused oblique dark antemedial line ; a dark discoidal bar ; postmedial line rather diffused, dark, somewhat oblique to vein 3, then bent inwards to lower angle of cell and erect to inner margin, a

white spot beyond it on costa; a dark terminal line and line near base of cilia which are white at tips towards tornus. Hind wing grey-brown with slight dark irroration; an oblique dark discoidal striga; postmedial line rather diffused, dark, oblique to vein 3, then bent inwards to below angle of cell and oblique to inner margin; a dark terminal line and line near base of cilia which are pure white at tips; the underside brownish grey with the inner area whitish.

Ab. 1. Fore wing without the white spot on costa beyond the postmedial line.

*Hab.* DUTCH N. GUINEA, Kapaur (*Doherty*), 1 ♂, Mimika R. (*Wollaston*), 1 ♂ type, Wataikwa R. (*Wollaston*), 1 ♂. *Exp.* 24–28 mm.

(43 e) *Nacoleia hemiombra*, sp. n.

♂. Head and tegulae red-brown; thorax and abdomen grey-brown, the latter with slight grey segmental lines and the anal tuft blackish; slight white streaks above the eyes; palpi black, white at base; fore tibiae at extremities, mid tibiae above, and the tarsi whitish. Fore wing with the costal area to beyond middle, the cell, and the inner area to before middle grey suffused with brown, bounded by an oblique black line from cell to inner margin, the rest of wing red-brown; a black point in middle of cell and small spot at lower angle; postmedial line blackish, straight and faintly defined on outer side by grey from costa to vein 2, then slightly bent inwards and oblique to inner margin; a series of small black spots just before termen; a fine blackish terminal line. Hind wing fuscous brown slightly irrorated with grey to just beyond the dark postmedial line which is slightly incurved below vein 2 and ends above tornus; a series of black striae just before termen and blackish line near base of cilia; the underside uniform fuscous brown.

*Hab.* SANDWICH Is., Kauai (*Perkins*), 1 ♂ type. *Exp.* 28 mm.

(43 g) *Nacoleia scotæa*, sp. n.

Head, thorax, and abdomen fuscous brown with a reddish tinge; palpi black, white at base; mid tibiae above and the tarsi whitish. Fore wing grey-brown irrorated with dark brown, the medial area except the upper part of cell and the costal area to near postmedial line red-brown, the costal area beyond the postmedial line suffused with red-brown; antemedial line slight, dark, erect, from below costa to inner



margin, defining the dark medial area; a black point in middle of cell and slight discoidal lunule; postmedial line indistinct, dark, straight from costa to vein 3, then slightly bent inwards and oblique to inner margin; a series of small black spots just before termen and fine blackish line at base of cilia. Hind wing fuscous brown slightly irrorated with grey; an indistinct, diffused, slightly curved, dark postmedial line; a blackish terminal line and fine line near base of cilia; the underside uniform grey-brown.

*Hab.* SANDWICH Is., Hawaii, Kilauea (*Perkins*), 1 ♂ type, Oahu, Honolulu (*Perkins*), 1 ♀. *Exp.* 26 mm.

(45 a) *Nacoleia selenalis*, sp. n.

♀. Head and thorax brown; abdomen grey-brown, with slight pale segmental lines on basal segments; pectus, legs, and ventral surface of abdomen white. Fore wing brown with a purplish tinge; a dark antemedial line, oblique from costa to median nervure; a white discoidal lunule defined by black on inner side; postmedial line dark, minutely dentate, bent outwards between veins 6 and 2, then retracted to below angle of cell; cilia with a fine dark line near base, white towards tornus. Hind wing cupreous brown with a purplish gloss; a slight dark discoidal spot with whitish before and beyond it; a slight dark minutely dentate postmedial line bent outwards between veins 5 and 2; cilia dark, whitish at tips towards apex and tornus; the underside white slightly tinged with brown, a small black discoidal lunule and punctiform postmedial line excurved between veins 5 and 2.

*Hab.* BORNEO, Sarawak (*Wallace*), 1 ♀ type. *Exp.* 24 mm.

(45 b) *Nacoleia pallidinotalis*, sp. n.

*Nacoleia pallidinotalis*, Wileman, Trans. Ent. Soc. 1911, p. 378, non descr.

Ochreous brown suffused with fuscous; palpi blackish except at base, the ventral surface pale; fore tibiæ with blackish band. Fore wing with oblique slightly sinuous dark antemedial line; a small rounded blackish orbicular stigma and a rather larger somewhat quadrate reniform stigma with pale centre with a small quadrate whitish spot between it and the orbicular stigma; the postmedial line dark defined by whitish on outer side, nearly straight or minutely dentate from costa to vein 3, then retracted to lower angle of cell and excurved again. Hind wing with small discoidal spot; the postmedial line dark defined by

whitish on outer side, minutely or hardly dentate, bent outwards between veins 5 and 2, then retracted to lower angle of cell and excurved again; both wings with fine dark terminal line, the cilia dark with a pale line at base.

*Hab.* JAPAN, Hakodate (*Leech*), 1 ♀, Satsuma (*Leech*), 1 ♀; COREA, Gensan (*Leech*), 1 ♀; C. CHINA, Ichang (*Mrs. Pratt*), 1 ♂; W. CHINA, 1 ♂ type. *Exp.* 26–28 mm.

(51 a) *Nacoleia leucographalis*, sp. n.

Head and thorax pale grey-brown; palpi black above, white below except at extremity; abdomen whitish tinged with brown and with slight segmental brown lines, more prominent on anal segment; pectus and ventral surface of abdomen whitish. Fore wing pale grey-brown, the costal edge darker towards base; an erect blackish antemedial line defined by white on inner side; a small blackish discoidal lunule; postmedial line blackish defined by white on outer side, somewhat expanding at costa, oblique from costa to vein 2, then retracted to below angle of cell; cilia fuscous with a fine white line at base. Hind wing pale grey-brown; a blackish discoidal bar; postmedial line blackish defined by white on outer side, oblique from costa to vein 2, then retracted to below angle of cell and oblique to inner margin above tornus; cilia fuscous with a fine white line at base; the underside white slightly tinged with brown.

*Hab.* SIERRA LEONE (*Clements*), 1 ♂ type; GOLD COAST, Kumasi (*Whiteside*), 1 ♂, 1 ♀. *Exp.* 22 mm.

(51 b) *Nacoleia atrivenalis*, sp. n.

♂. Head and thorax brown slightly tinged with fuscous; palpi black, white below; abdomen brown with slight whitish segmental rings, white below. Fore wing pale brown with a cupreous gloss, the terminal area suffused with fuscous; a curved black antemedial line; a black point in middle of cell and discoidal lunule; postmedial line black, excurved at vein 7 and between veins 5 and 2, then retracted to below angle of cell and again excurved at vein 1; a terminal black line; cilia grey with series of white points at base followed by a fuscous line. Hind wing pale brown with a cupreous gloss, the terminal area tinged with fuscous; a small black discoidal spot; postmedial line black, excurved below costa and between veins 5 and 2, then retracted to below angle of cell and oblique and sinuous to above tornus; a terminal black line; cilia white with a black line near base.

*Hab.* PARAGUAY, Sapucay (*Foster*), 2 ♂ type. *Exp.* 26 mm.

[To be continued.]

XLV.—*Descriptions of a new Helicoid Land-Shell from Cape Colony and a new Succinea from the Zambezi River.*  
By H. B. PRESTON.

*Natalina o'connori*, sp. n.

Shell imperforate, globosely turbinate, very thin, transparent, pale greenish brown; whorls  $3\frac{1}{2}$ , the last large, convex, marked with rather coarse growth-plicæ and sculptured with wavy spiral lines crossed by very fine transverse striae, thus presenting a slightly decussate appearance; suture *very narrowly* channelled, amber-coloured; columella almost vertically descending above, somewhat oblique below; labrum simple; aperture roundly ovate.

Alt. 8·25, diam. maj. 11, diam. min. 9·25 mm.

Aperture: alt. 6·75, diam. 5·5 mm.

*Hab.* Ceres District, Cape Colony, on the trunks of eucalyptus-trees (*E. J. O'Connor*).



*Natalina o'connori*.



*Succinea connollyi*.

*Succinea connollyi*, sp. n.

Shell elongately rhomboidal, moderately thin, with obtuse apex, polished, shining, pale brownish-amber colour; whorls 3, rapidly increasing, the last very long, marked with irregular and rather coarse growth-lines, crossed, especially towards the later portion of the last whorl, by scratch-like horizontal striae; suture impressed; columella descending in a slight curve and diffused above into a coarse, narrow, well-defined callus which reaches the upper margin of the labrum; labrum simple, slightly dilated below and contracted towards its uppermost limit; aperture elongately ovate; interior of shell slightly iridescently nacreous.

Alt. 16, diam. maj. 7·5, diam. min. 5·25 mm.

Aperture: alt. 12, diam. 6 mm.

*Hab.* Victoria Falls, Zambezi River (*M. Connolly*).

XLVI.—*An Enumeration of the Hymenoptera (Families Vespidae, Apidae, and Tenthredinidae) collected in Dutch New Guinea by the Expedition of the British Ornithologists' Union.* By GEOFFREY MEADE-WALDO, M.A.

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THE three families dealt with in the following paper are represented by thirty-two species, five of which are described as new. The genus *Icaria*, to which all five belong, appears to be very strongly represented in New Guinea, no less than nine of the fourteen species of Vespidae, subfamily Vespinae, collected, falling into it. As will be gathered from the localities, all of which are in river-valleys, the species must be regarded as lowland forms. Mr. A. F. R. Wollaston, the collector of all the Hymenoptera taken during the Expedition, is to be congratulated on the fine condition of the specimens. The whole collection here enumerated, including the types of the new species, is in the British Museum. All measurements of length are from the front of the head to the apex of the second abdominal segment.

Family Vespidae, Latr.

Subfamily EUMENIDINÆ, D. T.

EUMENES, Latr.

1. *Eumenes arcuata*, F.

*Eumenes arcuata*, F. Syst. Entom. p. 371. no. 40 (1775).

1 ♂, 2 ♀, Wataikwa River; August, September, 1910.

Three examples of the typical form, which occurs throughout the Eastern Archipelago.

2. *Eumenes agillima* (Smith), D. T.

*Eumenes agilis*, Smith, Journ. Proc. Linn. Soc., Zool. iv. Suppl. p. 127. no. 7 (1860).

4 ♀, Mimika River; July 1910.

Described from Amboyna; also recorded from Ceram (Wallace).

RHYNCHIUM, Spin.

3. *Rhynchium hæmorrhoidale*, F., subsp. *medium*, Maindron.

*Rhynchium hæmorrhoidale*, F., subsp. *medium*, Maindron, Ann. Soc. Ent. France, (6) ii. p. 278 (1882), pl. v. fig. 1.

4 ♀, Mimika River; July 1910.



## ODYNERUS, Latr.

4. *Odynerus (Lionotus)* sp.

1 ♀, Mimika River; July 1910.

This single specimen belongs to the subgenus *Lionotus* and closely resembles *O. confluentus*, Sm., in coloration. There are structural differences which make it impossible to consider it as a variety, and it would thus be better to leave the species unnamed for the present.

## Subfamily VESPINÆ, D. T.

## ISCHNOGASTER, Guérin.

5. *Ischnogaster fulgipennis*, Guér.

*Ischnogaster fulgipennis*, Guér., Duperrey, Voy. 'Coquille,' Zool. vol. ii. pt. 2, p. 269, pl. ix. fig. 9 (1839).

1 ♀, Mimika River, July 1910; 1 ♂, Wataikwa River, August 1910.

6. *Ischnogaster iridipennis*, Smith.

*Ischnogaster iridipennis*, Sm. Journ. Proc. Linn. Soc., Zool. iii. p. 166. no. 1 (1858).

1 ♀, Mimika River; August 1910.

Also recorded from Mysol and Aru (Wallace).

## ICARIA, Sauss.

The species of *Icaria* do not seem to vary much in colour or size, unlike *Polistes*, in which both of these characters vary extensively. All the five species here described as new have the clypeus of the typical form for the genus, *i. e.* short, broad, and produced to a point at the apex, so that it has not been considered necessary to refer to it in the detailed descriptions.

The subgenera, adopted by Dalla Torre in the 'Genera Insectorum,' Fam. Vespidae, have been used for the discrimination of the new species.

7. *Icaria conservator*, Smith.

*Icaria conservator*, Smith, Journ. Proc. Linn. Soc., Zool. iv. Suppl. p. 130. no. 1 (1860)

8 ♀, from Mimika River; July and August 1910.

The whole series of this species in the Museum is from

New Guinea, but *Polybia limatula*, Sm., which is synonymous with the above (Ann. & Mag. Nat. Hist. (8) vol. vii. p. 100, 1911), was described from Mysol and is in the Oxford University Museum.

### 8. *Icaria australis*, Sauss.

*Icaria australis*, Sauss. Étud. fam. Vesp. ii. p. 24. no. 2, pl. xxxiv. fig. 5 (1853).

The single specimen from Mimika River, July 1910, agrees well with Saussure's figure.

### 9. *Icaria maculiventris*, Guérin.

*Rhopalidia maculiventris*, Guérin, Duperrey, Voyage de la 'Coquille,' Zool. vol. ii. pt. 2, p. 266, pl. ix. fig. 8 (1839).

5 ♂, Mimika River; July and August 1910.

All these specimens have the second abdominal tergite almost entirely yellow, as mentioned by Du Buysson (Abhandl. der Senckenb. naturforsch. Gesell. Bd. xxxiv. Heft 2, p. 229, 1911). There are other specimens in the British Museum from Aru and Borneo.

Guérin's type was from Dorey, New Guinea, *not* Australia as given by Dalla Torre in the 'Genera Insectorum.' Fam. Vespidae.

### 10. *Icaria spilostoma*, Cam.

*Icaria spilostoma*, Cam. Nova Guinea, v. 1, p. 62 (1906).

3 ♂, Mimika River; July and August 1910.

Cameron's type, which is in the British Museum, is from Manokwari, in New Guinea.

### *Key to the new Species of Icaria here described.*

A. Abdominal segment 2 broader than long.

(*Icariastrum*, D. T.)

a. Wings totally fuscous ..... *wollastoni*, sp. n.

b. Wings hyaline, slightly fuscous along the costa.

a<sup>2</sup>. Truncation of median segment smooth and shining, lateral angles produced to form two spines ..... *bispinosa*, sp. n.

b<sup>2</sup>. Truncation of median segment finely punctured, clothed with grey pubescence, lateral angles bluntly rounded ..... *mimikæ*, sp. n.

B. Abdominal segment 2 longer than broad.

(*Icariola*, D. T.)

- a. Petiole elongate, widening gradually towards apex, armed medio-laterally with two small tubercles. .... *semihyalinata*, sp. n.  
 b. Petiole unarmed, widening abruptly towards apex ..... *fluviatilis*, sp. n.

11. *Icaria (Icariastrum) wollastoni*, sp. n.

♀. Niger: clypeo apice mandibulisque basi flavo-maculatis, margine interiore oculorum maculaque bilobata interantennali flavis, abdominis segmentis 2-6 flavo-fasciatis, petiolo apice lateribus flavo-maculato; capite (præcipue postoculos) thoraceque cano-pubescentibus; segmento mediano concave truncato; alis fuscis.

Black; two ovate marks on clypeus at apex, a small mark on the mandibles at base, a bilobed spot between the antennæ, a line along the inner margin of the eyes, a line on the apex of petiole laterally, and the apical margins of abdominal segments 2-6 deep yellow. Wings deep fuscous. Head rather broader than thorax, a blunt tubercle between the antennæ at base. Prothorax truncate anteriorly, somewhat sloping posteriorly, scutellum with a shallow longitudinal depression, median segment with the dorsal surface of the truncation excavated medially, the lateral angles bluntly rounded; petiole cup-shaped, widening abruptly towards apex.

Head and thorax finely, abdomen rather more closely punctured, the truncation of the median segment within the excavated area, impunctate. Head and thorax covered with a short dense pubescence, densest on face and clypeus and behind the eyes, pubescence on clypeus appearing golden when viewed from above.

Length  $12\frac{1}{2}$  mm.

*Hab.* Mimika River, July 1910; 4 ♂.

This fine species is most closely allied to *I. maculiventris*, Guérin, but may be readily separated from it by the colour of the wings, which are dark fuscous, *not* hyaline as in that species, and by the colour-marking of the abdomen.

I have pleasure in naming this species after my friend Mr. A. F. R. Wollaston, who collected all the Hymenoptera brought home by the Expedition.

12. *Icaria (Icariastrum) bispinosa*, sp. n.

♀. Niger, griseo-punctatus; mandibulis macula flava basi minuta, abdominis segmentis flavo-fasciatis; pronoto petioloque lateribus ferrugineis; alis hyalinis.

Black; with two small elongate marks on the mandibles

at base, two small spots between the antennæ, yellow, all the abdominal segments both dorsally and ventrally with yellow apical fasciæ. Flagellum beneath apically, pronotum and petiole laterally marked with ferruginous. Wings hyaline.

Head rather broader than thorax, anterior margin of the prothorax truncate, scutellum with a shallow longitudinal furrow, median segment truncate, excavated medially on the dorsal surface, the lateral angles produced to form two spines. Petiole with two small medio-lateral tubercles, slender at base, widening abruptly towards the apex, which is flattened above.

Head, clypeus, mandibles, and abdomen very finely, thorax rather more coarsely punctured, the area immediately surrounding the insertion of the antennæ, and the surface of the truncation of the median segment, shining, impunctate.

The whole more or less covered with a greyish pubescence, most conspicuous on the vertex and the terminal segments of the abdomen.

Length  $10\frac{1}{2}$  mm.

*Hab.* Mimika River, July and August 1910; 4 ♀.

This species comes very near *I. spilostoma*, Cam., but differs in having all the abdominal segments with apical yellow fasciæ, whereas in *I. spilostoma* the second segment alone is so coloured.

### 13. *Icaria* (*Icariastrum*) *mimikæ*, sp. n.

♀. Niger, griseo-punctatus; mandibulis, clypeo partim, antennis infra, margine interiore oculorum, pronoto antice, abdominis segmento secundo fascia apicali supra, segmento sexto omnino, tibiis tarsisque anticis, ochraceo-testaceis; scapo, propleuris, tegulis fusco-ferrugineis; alis hyalinis, costa cellulaque radiali infuscatis. Plus minusve punctatus; segmento mediano dense, capite, thorace, abdomine, sparse pilosis.

Black; two marks on clypeus at apex, mandibles, a line along the inner margin of the eyes, the antennæ beneath, anterior margin of the pronotum, a fascia on the apical margin of the second abdominal segment ochraceo-testaceous. Abdominal segments 3-5 with very faint apical fasciæ, abdominal segment 6 totally testaceous. Wings hyaline, fuscous along the costa and in the radial cell. Scape above, propleuræ, and tegulæ fusco-ferruginous.

Head considerably broader than pronotum, which widens posteriorly, scutellum and postscutellum prominent, median segment truncate, excavated medially, lateral angles bluntly rounded.



Petiole slender at base, widening abruptly at apex, flat beneath. Punctured, head and thorax for the most part rather coarsely, the abdomen more finely.

The area behind the eyes adjoining the mandibles and the postscutellum beneath shining, impunctate.

The whole clothed with short sparse golden pubescence, except the median segment, which is covered with a dense silvery pile.

Length 11 mm.

*Hab.* Mimika River; August 1910.

14. *Icaria (Icariola) semihyalinata*, sp. n.

♂. Niger, gracilis; mandibulis clypeoque basi, scapo infra, linea brevi margine interiore oculorum, abdominis segmentis 2-6 fasciis apice ochraceis; tibiis omnino, tarsis plerumque ochraceis; prothorace tegulisque ferrugineis; alis fusco-hyalinis.

Black; mandibles at base, two spots on the clypeus at apex, the scape beneath, short lines on the inner margins of the eye, and apical fasciæ on abdominal segments 2-6 ochraceous yellow. Prothorax and tegulæ ferruginous; wings fusco-hyaline. Prothorax narrow anteriorly, widening towards the tegulæ, median segments truncate, medially excavated; petiole slender, gradually widening towards apex, armed medio-laterally with two small tubercles.

Punctured, the vertex and disc of mesonotum minutely, abdominal segments 2-6 rather more coarsely, the remainder impunctate. Clothed with greyish-white pubescence.

Length  $9\frac{1}{2}$  mm.

*Hab.* Mimika River, July 1910; 1 ♀.

15. *Icaria (Icariola) fluviatilis*, sp. n.

♂. Niger; maculis duabus clypeo, margine interiore oculorum, linea postoculari, abdominis segmentis apice fasciis, flavis; tibiis tarsisque anterioribus infra ferrugineis; alis hyalinis, costa cellulaque radiali pallide fuscis.

Black; two spots on the clypeus, the inner margin of the eyes, a long narrow line behind them, and all the abdominal segments (that on the petiole interrupted medio-dorsally) with narrow apical fasciæ yellow. Wings hyaline, somewhat fuscous along the costa, in the radial cell, and at the tip.

Head as broad as thorax; thorax short, massive, the prothorax truncate anteriorly; median segment truncate, the surface of the truncation hardly excavated. Petiole short, widening abruptly towards the apex, with no lateral tubercles.

Head (except clypeus and mandibles), thorax, and abdomen very finely punctured. Covered with a short, greyish, inconspicuous pubescence.

Length 9 mm.

*Hab.* Mimika River, August 1910; 1 ♂.

## POLISTES, Latr.

### 16. *Polistes nigrifrons*, Smith.

*Polistes nigrifrons*, Smith, Journ. Proc. Linn. Soc., Zool. iii. 168. no. 4 (1858).

1 ♀, Mimika River; July 1910.

Smith reports it from Waigiou and Aru (*Wallace*).

### 17. *Polistes* sp.

### 18. *Polistes variabilis*, F.

*Polistes variabilis*, F. Spec. Insect. i. p. 466. no. 46 (1781).

1 ♀, Wataikwa River; August 1910.

An Australian species—Queensland: Inkerman, near Townsville (*W. Stalker*); Mackay (*Turner*); Port Darwin and Bathurst Island (*J. J. Walker*).

### 19. *Polistes tepidus*, F.

*Polistes tepidus*, F. Syst. Entom. p. 366. no. 17 (1775).

3 ♂, Mimika River; July and August 1910.

Australia: Queensland (var. *facilis*, Sauss.), Cooktown, Cairns, and Mackay (*Turner*); Victoria (*French*); Darnley Island; Lizard Island. New Guinea, Manokwari (*Wichmann*); New Pomerania (*Rippe*) (race *nova-pomeraniae*, Schulz); Solomon Islands (*W. W. Froggatt*); Key Island, Aru, Bachian, Waigiou (*Wallace*).

## VESPA, L.

### 20. *Vespa cincta*, F., var. *affinis*, F.

*Vespa cincta*, F., var. *affinis*, F. Mant. Ins. i. p. 287. no. 2 (1787).

2 ♀, Wataikwa River; August 1910.

Widely distributed throughout the Eastern Archipelago.

## Family Apidæ, Leach.

## Subfamily ANTHRENINÆ.

21. *Nomia* sp.

*Hab.* Wataikwa River, August 1910; 2 ♂.

This may possibly be a new species, but it is not advisable to describe the species of this genus from males alone.

## Subfamily PODALIRINÆ.

## ANTHOPHORA, Latr.

22. *Anthophora zonata*, L.

*Anthophora zonata*, L. Syst. Nat. no. 15, p. 576 (1758).

1 ♀, Mimika River; August 1910.

23. *Anthophora* sp.

There are four males and two females of a species of *Anthophora* from the Mimika and Wataikwa Rivers, July and August 1910.

Possibly they are colour-varieties of *A. zonata*, with the abdominal fasciæ greenish white.

## Subfamily NOMADINÆ.

## CROCISA, Jurine.

24. *Crocisa cæruleifrons*, Kirby.

*Crocisa cæruleifrons*, Kirby. Proc. Zool. Soc. Lond. p. 343 (1883).

6 ♀, Mimika River; July 1910.

Kirby described this handsome species from Maroe, Timor-Laut (*H. O. Forbes*); it has also been received from Mackay, N. Queensland (*Turner*).

## Subfamily MEGACHILINÆ.

## MEGACHILE, Latr.

25. *Megachile albiceps*, Friese.

*Megachile albiceps*, Friese, Zeitschr. Hym. Dipt. iii. p. 243 (1903).

4 ♀, Mimika River; July 1910.

Described from Goram.

26. *Megachile nidulator*, Smith.

*Megachile nidulator*, Sm. Journ. Proc. Linn. Soc., Zool. viii. p. 92. no. 4 (1864).

4 ♀, Mimika River; July 1910.

Described from New Guinea.

27. *Megachile malayana*, Cam.

*Megachile malayana*, Cam. Proc. Zool. Soc. Lond. ii. p. 245 (1901).

1 ♀, Mimika River; July 1910.

This specimen agrees with Cameron's type from New Guinea in all essential characters, but is larger and has the anterior tarsi black, not pale testaceous.

## Subfamily APINÆ.

## MELIPONA, Ill.

28. *Melipona præterita*, Wlk.

*Melipona præterita*, Wlk. Ann. & Mag. Nat. Hist. (3) v. p. 305 (1860).

3 ♀, Mimika and Wataikwa Rivers; July and August, 1910.

This appears to be a fairly widely spread species, occurring in Burma and Ceylon (*Bingham*), Singapore (*Ridley*), and is recorded from Etua Bay and Merauke by Friese ('Nova Guinea,' v. 2, p. 355, 1908) among the collection formed by the Wichmann Expedition.

29. *Melipona planifrons*, Smith.

*Melipona planifrons*, Sm. Journ. Proc. Linn. Soc., Zool. viii. p. 93. no. 2 (1864).

2 ♀, Mimika River; July 1910.

As Friese notes in his account of the Apidæ captured on the Wichmann Expedition, this species appears to be confined to New Guinea. There are specimens in the British Museum from the Charles Louis Mountains (Dutch New Guinea) and from Dorey (*Wallace*).

30. *Melipona* sp.

4 ♀, Mimika and Wataikwa Rivers, July and August 1910; Iwaka River, February 1911.



## Family Tenthredinidæ.

## Subfamily LOPHYRIDINÆ.

## ANCYLONEURA, Cam.

31. *Ancyloneura nigripes*, Smith.

*Cryptocampus nigripes*, Smith, Journ. Proc. Linn. Soc., Zool. v. p. 136 (1861).

1 ♀, Mimika River; August 1910.  
Described from New Guinea.

32. *Ancyloneura* sp.

1 ♀, Iwaka River; February 1911.

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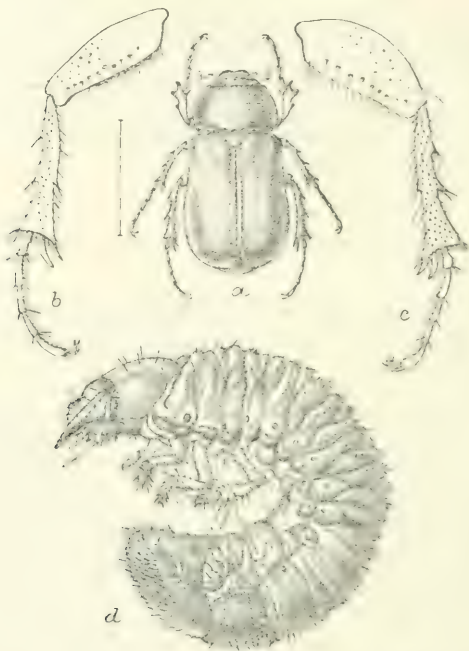
XLVII.—On a new Species of Melolonthid Beetle (*Phytalus smithi*) destructive to Sugar-cane. By GILBERT J. ARROW.

(Published by permission of the Trustees of the British Museum.)

THE beetle here described has recently appeared in enormous numbers in Mauritius, where its presence was discovered for the first time by the very serious damage to the roots of the cane-crops caused by its subterranean larvæ. The first account of it was given by M. d'Emmerez de Charmoy in an official Report issued by the Government of the Colony and dated 7th Aug., 1911. The insect was provisionally attributed to *Schizonycha*, of which two species have been catalogued as natives of the Madagascan region; but specimens referred to me for accurate determination showed it to belong not to that Old-World genus, but to the American *Phytalus*. I eventually found three specimens labelled "Trinidad" in the British Museum, which, although of small size and in bad preservation, undoubtedly belong to the same species. I failed, however, to find any record of such an insect being known to West-Indian entomologists, and as Mr. Guy Marshall, of the Entomological Research Committee, was visiting the islands, he kindly undertook to make an effort to find it, taking specimens sent to me from Mauritius for comparison. In this he was quite successful, discovering the beetle and larva at the roots of cane-stumps in Barbados, the

larvæ being in considerable numbers in company with those of a weevil, *Diaprepes*.

Amongst a quantity of the two larvæ brought back in spirit by Mr. Marshall I found one of the Lamellicorn to the thorax of which was firmly attached externally a tiny grub, apparently that of a Hymenopterous parasite, in the manner described by Fabre as characteristic of the Scoliidæ. This is



*Phytalus smithi* (a, male, enlarged), with hind leg of male (b) and female (c) and the larva (d), magnified 3 diameters.

the family of Solitary Wasps of which Lamellicorn larvæ are the special prey, the female wasp depositing an egg upon the victim after paralyzing it with her sting, and her offspring burying its head in the motionless body and gradually reducing it to an empty skin, beside which it forms its own cocoon. Mr. Marshall happens to have seen a female *Scolia* (*S. (Dielis) dorsata*, F.) examining the ground in a cane-field in Barbados, and in all probability this species systematically preys upon the *Phytalus*, and it is due to it that no great damage has been done by the latter, although sugar is

a highly important crop in the island. The beetle is little known there, and its depredations have attracted no notice. On the other hand, its enormous multiplication in Mauritius is explained by its having gained an entrance to an island where its natural enemy is absent. An allied species of *Scolia* (*S. (Dielis) rufa*, Lep.) is known to exist in Mauritius, but has evidently not attacked the invader.

Another useful agent in reducing the beetles in Barbados is the so-called blackbird (*Quiscalus*), which rapidly clears the cane-stumps of the larvæ when uprooted. The birds eagerly follow the men so engaged, but are not able to reach the insects beneath the ground.

Mr. Marshall failed to find any specimen of the *Phytalus* in the collections made in Trinidad by Messrs. Ulrich and Guppy, nor did he see it in any island which he visited except Barbados: but it may yet be found to inhabit other islands or the mainland of America.

Previous to finding the specimens labelled "Trinidad," I had ascertained that cane-cuttings were imported into Mauritius from Demerara and the West Indies; but my opinion that the insect had been imported from that region was not at first accepted by M. de Charmoy, who considered it improbable, since the imported cuttings are packed in charcoal. It can hardly be doubted, however, that my explanation was the true one, and that a few specimens accidentally imported, probably several years ago, and multiplying unchecked, were the progenitors of the millions now ravaging the crop.

The outbreak was first noticed in the vicinity of the Royal Botanical Gardens at Pamplémousses, and was reported to affect 30 acres of plantations; but at the date of the Report of the Director of Forests and Gardens in August last it was found that 300 acres had been affected and, in a letter to me in the following October, M. d'Emmerez de Charmoy records that 2,000,000 larvæ had been collected and as many as 80,000 adult beetles were destroyed in a single night. Between August and January it was calculated that over 27,000,000 had been destroyed.

The eggs are laid in the soil during three months of the year, the female laying from one to ten every two or three nights until from forty to sixty in all have been deposited. They hatch in a period of from nine to twenty-two days, according to temperature, and the young larvæ are reported by M. de Charmoy to feed at first upon the organic matter in the soil itself and later upon the roots of the cane. As many as 50 or 60 grubs have been found in a single stump, the

roots being then completely destroyed. They are capable of moving from place to place, and a single hole has been repeatedly cleared of them at short intervals. They are found from 4 to 12 inches below the surface of the ground. The larva when full-grown is about 25 mm. in length, with the head large, the succeeding (thoracic) segments wider and the abdominal segments narrower. Previous to pupation it forms an elliptical cell in the soil. The beetle emerges in August. It is nocturnal in its habits, remaining concealed beneath the ground by day and flying at night to feed upon the leaves of trees and shrubs. It does not appear to eat the leaves of sugar-cane, but is believed to have a special liking for those of Liberian coffee. The life-cycle is believed to be completed in a year. These particulars are taken from M. de Charmoy's official report and from his letters to me.

The specific characters of the beetle are as follows:—

*Phytalus smithi*.

*Læte rufus, elytris, abdomine femoribusque fulvis, cylindricus sat elongatus, nitidus, corpore subtus breviter et rare piloso; capite haud magno, omnino rugose punctato, clypeo brevi bilobato, a fronte sulco profundo diviso; antennis utriusque sexus similibus, 9-articulatis, articulis 2-6 brevibus, clava brevissima; pronoto modico brevi, sat grosse punctato, lateribus fere obsolete crenatis, medio fortiter curvatis, haud angulatis, antice rectis, contractis, angulis omnibus obtusis; scutello punctato; elytris fortiter crebre punctatis, costa suturali sat lata, fere levi, aliaque dorsali obliqua obsoleta; pygidio eodem modo crebre punctato; corpore subtus crebre subtilius punctato, sed medio fere levi: prosterno postico medio bidentato.*

Long. 14-17.5 mm.; lat. 7-9 mm.

It is of the tawny-red colour of the common *P. obsoletus*. Bl., and many other species, the head, prothorax, and scutellum being of a deeper red than the other parts, smooth and rather shining, with only very short and scanty hairs upon the lower surface. The general form and sculpture are also very much as in *P. obsoletus*, but the clypeus is a little more notched in the middle of the front margin and much more sharply divided from the forehead, and the elytra are rather more strongly punctured. The antennæ consist of nine joints, of which the scape forms fully a third of the total length, the second joint is globular, the third to the sixth short and diminishing progressively in length, the last three forming a very short club, not longer in the male than the female. The claws are cleft into two nearly equal



branches and without the minute tooth at the base found in *Schizonycha*.

The male has the abdomen more tumid beneath, and the hind femora of the female are shorter and thicker than those of the male.

By M. de Charmoy's desire the beetle has been named in honour of Mr. G. Smith, late acting Governor of Mauritius, in recognition of his interest in and support of the work of investigation.

This insect was very naturally ascribed to *Schizonycha*, a great African genus to which it has a very great affinity, but it seems to me extremely doubtful if that genus is really represented in the Mascarene region. *Schizonycha hova*, Coq., appears to belong to *Horacheus*, and the quite insufficiently described *S. glabra*, Brenske, may belong to that genus also. The genus *Phytalus* represents in Tropical America the African *Schizonycha* (a few species of which are also found in Tropical Asia), and the two genera have the closest affinity. Our insect differs from *Schizonycha* and agrees with *Phytalus* in the following points:—The front margin of the clypeus does not form a continuous curve, but is notched in the middle, and the elytra have a well-defined elevated strip bordering the suture and an ill-defined narrow costa at a short distance from it. The antennæ are very short and consist of nine instead of ten joints. The same number is found in certain species of *Schizonycha* (which have been separated under the name of *Atys*), but this has been produced by the fusion of the fourth and fifth joints into a long rod. In *Phytalus* the seventh joint seems to disappear and the structure of the antennæ is very inconstant, even the number of joints composing the club being variable.

XLVIII.—*New Genera and Species of Oriental Homoptera.*  
By W. L. DISTANT.

Fam. Cicadidæ.

*Mata rama*, sp. n.

Head, pronotum, and mesonotum greenish ochraceous; lateral margins of front, two central linear fasciæ to vertex—almost enclosing the ocelli,—two spots on each lateral margin of vertex and inner margins of eyes, pronotum with two central longitudinal fasciæ, united anteriorly and posteriorly,

and an inner lateral marginal line, black; mesonotum with two central obconical spots denoted by their dark margins, a central sagittiform spot, a more or less obscure and sub-obsolete sublateral fascia, and a rounded spot before each anterior angle of the cruciform basal elevation, black; abdomen above more or less testaceous brown; head beneath, sternum, and legs virescent, abdomen beneath testaceous brown; opercula in male virescent, their posterior and lateral margins piceous; tegmina and wings hyaline, the first with the costal membrane greenish ochraceous, stig-matal spot black, apices of the first and second radial areas infuscated; venation of tegmina and wings more or less piceous; pronotum with the lateral margins very slightly convex, sinuate before the posterior lateral angles, which are moderately, lobately produced; tympanal coverings piceous, their outer margins a little sinuate, the posterior angles alone projecting beyond the lateral margins of the abdomen; opercula short, transverse, scarcely extending beyond the base of the abdomen, their lateral margins visible from above, their posterior lateral angles rounded, their posterior margins oblique; rostrum reaching the posterior coxæ.

Long., excl. tegm., ♂ and ♀ 17 mm.; exp. tegm., ♂ 55, ♀ 63 mm.

*Hab.* Bhutan (Brit. Mus.).

Very distinct from *M. kama*, Dist., the only other described species of the genus; tegmina proportionally shorter and almost unspotted, &c.

### *Tettigia orientalis*, sp. n.

♂. Head, pronotum, and mesonotum dull ochraceous; lateral marginal lines to front (not meeting centrally), a transverse line at anterior angles of vertex, area of the ocelli, narrow posterior margins of eyes, inner linear basal and lateral margins of pronotum, the margins of two ob-conical spots to mesonotum, and three spots near each anterior angle of the basal cruciform elevation (the outer-most largest and triangular, the two innermost transverse), black; abdomen above pale testaceous, sparingly greyish pilose, posterior margins of the segments very narrowly black; head beneath, sternum, and legs dull ochraceous; face with two central series of transverse black striations; cheeks streaked with black; abdomen beneath pale testaceous; tegmina and wings hyaline, the venation brownish, the tegmina with the costal membrane dull ochraceous, the

apical veins to the first and second ulnar areas and the apices to the longitudinal veins to the apical areas slightly infuscated; tympanal coverings narrower but scarcely shorter than tympanal cavities; lateral margins of the pronotum moderately ampliate and sinuate, distinctly but obtusely biangulate; opercula in male short, about reaching the anterior margin of the second abdominal segment, the outer margins sinuate and obliquely directed inwardly, the apices narrowly rounded, the inner margins widely separated.

Long., excl. tegm., ♂ 35 mm.; exp. tegm. 102 mm.

Hab. Cochin China (Brit. Mus.).

The largest species of the genus at present described.

### ONOMACRITUS, gen. nov.

Head transverse, much shorter than the breadth between eyes, eyes large and upwardly prominent, as seen beneath distinctly exerted, lateral margins of vertex and front almost continuous; face broad, narrowing to clypeus, an obscure central tubercle near anterior margin, clypeus strongly centrally ridged, only a little shorter than face; pronotum considerably longer than head, a little shorter than mesonotum, the lateral margins a little ampliate, concavely sinuate before the lateral angles, which are roundly prominent and a little upturned, slightly and obscurely angulate before the concave sinuation; abdomen much longer than space between apex of head and base of cruciform elevation, tympanal coverings narrower but scarcely shorter than tympanal cavities; rostrum passing the base of abdomen; opercula in male small and transverse, widely separated internally; tegmina elongate, narrow, more than three times as long as broad; wings only half as long as tegmina, but nearly as broad, six apical areas, their basal margins almost at right angles with each other.

Allied to *Tettigia*, but differing in the short transverse head, the elongate and narrow tegmina, &c.

### *Onomacritus sumatranus*, sp. n.

Body above dull ochraceous, thickly, shortly, greyishly pilose; area of the ocelli, a small central spot at base of pronotum and a smaller spot in front of and on each side of same, black; mesonotum with the margins of two small anterior obconical spots and a large spot occupying the posterior halves of the lateral areas castaneous, a central discal line and a small spot in front of each anterior angle of the basal cruciform elevation black; head beneath, sternum,

legs, and rostrum pale ochraceous; abdomen beneath pale castaneous; about posterior half of face and two small spots on anterior half, greater part of cheeks, a transverse fascia between face and eyes, apex of rostrum, sixth abdominal segment, and disk of anal segment, black; tegmina and wings talc-like, subhyaline, the veins ochraceous or piceous, tegmina crossed before middle by a transverse fasciate series of three prominent piceous spots, the transverse veins at bases of apical areas and the apices of the longitudinal veins to same more or less infuscate, costal membrane ochraceous; opercula transverse, rounded, not reaching apex of first abdominal segment; rostrum passing middle of second abdominal segment; other structural characters as in generic diagnosis.

Long., excl. tegm., ♂ 20 mm.; exp. tegm. 54 mm.

*Hab.* Sumatra; Deli (Brit. Mus.).

*Terpnosia versicolor*, sp. n.

♂. Head, pronotum, and mesonotum virescent; lateral striations to front (not meeting anteriorly), area of the ocelli, narrow anterior and posterior margins to pronotum, the fissures and broad lateral marginal areas, the margins of two anterior obconical spots to mesonotum, on each side of which is a broad percurrent longitudinal fascia, and a spot in front of each anterior angle of the cruciform basal elevation, castaneous brown; abdomen above ochraceous, the posterior segmental margins virescent; head beneath, sternum, legs, and opercula virescent; cheeks and tibiae more or less suffused with castaneous brown; abdomen beneath brownish testaceous, disk of anal segment purplish brown; tegmina and wings hyaline, the venation and costal membrane of the former more or less virescent; opercula in male short and transverse, not extending beyond basal segment of abdomen; head deflected anteriorly, front not prominent, its length about equal to breadth between eyes; pronotum distinctly shorter than mesonotum.

Long., excl. tegm., ♂ 19 mm.; exp. tegm. 55 mm.

*Hab.* Burma; Ruby Mines (*Doherty*, Brit. Mus.).

Allied to *T. collina*, Dist.

*Terpnosia oberthuri*, sp. n.

♂. Closely allied in colour and markings to the preceding species *T. versicolor*, but the tegmina with the transverse veins at the apices of the ulnar areas and the apices of the longitudinal veins to apical areas distinctly infuscated; the



opercula much less truncate and more oblique, and in consequence of this being considerably wider apart than in *T. versicolor*.

Long., excl. tegm., ♂ 12 mm.; exp. tegm. 55 mm.

*Hab.* Bhutan (Brit. Mus.).

Near *T. pumila*, Dist., a Bornean species.

*Cicadatra inconspicua*, sp. n.

♂. Head piceous, anterior angles of vertex dull ochraceous; pronotum brownish ochraceous, a central reversed triangular piceous spot with a central ochraceous line, the basal marginal area piceous; mesonotum brownish ochraceous, with two anterior obsolete central obconical spots, on each side of which is a pereurrent submarginal piceous fascia, and a large piceous spot before the cruciform basal elevation; abdomen above pale brownish with piceous shadings, the posterior segmental margins pale ochraceous; body beneath and legs ochraceous; tegmina and wings hyaline, the venation, costal membrane, and basal claval streak to the first and anal marginal area of the latter ochraceous; a small transverse piceous spot above apex of radial area and a similar spot at apex of clavus to tegmina; opercula somewhat long, reaching the posterior margin of the basal abdominal segment, obliquely directed inwardly, their apices thus not very far apart, outwardly moderately convex, a little sinuate on each side near base, their apices subangularly rounded; rostrum reaching the intermediate coxæ.

Long., excl. tegm., ♂ 8 mm.; exp. tegm. 35 mm.

*Hab.* Brit. India; Mhow (Brit. Mus.).

A small species, somewhat intermediate between *C. raja*, Dist., and *C. striata*, Walk., but much smaller than either and to be distinguished by the distinct characters of the opercula.

Fam. Fulgoridæ.

Subfam. FLATINÆ.

*Melicharia obtusangula*, sp. n.

Body and legs pale dull ochraceous; tegmina creamy white with a very pale ochraceous tint, especially at costal membrane, extreme base, and claval area; wings pale creamy white; head (including eyes) a little narrower than pronotum, vertex centrally and laterally carinate, the anterior margin subtruncate, medially slightly angulate; face broad, with a central carination extending about half-way from base, the lateral margins broadly reflexed; clypeus

elongate; tegmina about one and a half times as long as broad, apical angle moderately rounded, posterior angle obtusely rounded, not rectangular; posterior tibiae with two spines, the apical spine short.

Long., excl. tegm.,  $5\frac{1}{2}$  mm.; exp. tegm. 16–17 mm.

*Hab.* Ceylon; Weligama (*Bainbrigge-Fletcher*), Mt. Lavinia (*Green*, Brit. Mus.), Trivandrum (*Atkinson Coll.*).

Differs from *M. lactifera*, Walk., by the obtusely rounded posterior angle of the tegmina.

*Hilavrita discolorata*, sp. n.

Body and legs brownish ochraceous, the mesonotum distinctly darker; tegmina brownish ochraceous, moderately greyishly tomentose, the basal disk and claval area with blackish granules, the longitudinal veins piceous; wings pale fuliginous, the veins piceous; head (including eyes) a little narrower than pronotum; face a little longer than broad, centrally carinate; pronotum rugosely granulate; mesonotum raised, obsoletely tricarinate; tegmina about one and a half times as long as broad, the apical and posterior angles rounded, costal membrane slightly wider than radial area.

Long., excl. tegm., 4 mm.; exp. tegm. 14–14 $\frac{1}{2}$  mm.

*Hab.* Bengal, Pusa (*C. S. M.*), Bombay (Brit. Mus.).

Allied to *H. fatua*, Melich., but smaller, no indications of dark spots on tegmina, which are distinctly narrower and proportionally more elongate.

*Hilavrita obliqua*, sp. n.

In general coloration closely allied to the preceding species *H. discolorata*, but differing widely in the shape of the tegmina, which have the apical angle broadly rounded and the apical margin strongly oblique to the posterior angle, the tegmina are also nearly twice as long as broad from base to apical angle, and in these characters differing from all other species of the genus yet described.

Long., excl. tegm.,  $4\frac{1}{2}$  mm.; exp. tegm. 12 $\frac{1}{2}$  mm.

*Hab.* Ceylon; Hambantota (*Bainbrigge-Fletcher*, Brit. Mus.).

FORCULUS, gen. nov.

Head twice as long as the pronotum, slightly ascendent anteriorly, anterior margin angularly rounded, lateral margins slightly sinuate, eyes large, at base of head overlapping the anterior angles of the pronotum; face longer than broad, concave, its anterior margin convex, angularly widened on

each side before eyes; clypeus about half as long as face, with a slight central longitudinal ridge; pronotum a little more than twice as broad as long, its anterior margin truncate between eyes and oblique behind eyes; mesonotum strongly tricarinate, posteriorly angulate, a little more than twice as long as pronotum; legs somewhat short and robust; femora longitudinally sulcate, compressed, posterior femora with a somewhat long and very distinct slender spine at apices; tibiae moderately compressed, sulcate, posterior femora with three spines on apical area; basal joint of tibiae short and thickened; rostrum reaching the intermediate coxae; tegmina elongate, widest at basal area, where the costal margin is strongly convexly arched, distinctly narrowed on apical third, costal membrane and about apical half strongly transversely veined, clavus more faintly transversely veined, very obsoletely granulate, apex of tegmen roundly truncate; wings broader than tegmina, posteriorly dilated at anal area, two transverse veins on apical areas.

Allied to the Neotropical genus *Cyarta*, Walk., and to be placed near the beginning of the Division *Selizaria*.

*Forculus peculiaris*, sp. n.

Head, pronotum, and mesonotum dull brownish ochraceous with darker mottlings; apex of mesonotum shining, greyish white; abdomen above greenish ochraceous, some of the segmental margins narrowly sanguineous; head beneath, sternum, and legs dull pale brownish ochraceous, concave disk of face more piceous; abdomen beneath greenish ochraceous; tegmina shining brownish ochraceous, costal membrane and apex more or less marked with olivaceous green; wings pale fuliginous with the veins darker; structural characters as in generic diagnosis.

Long., excl. tegm., 8 mm.; exp. tegm. 22 mm.

*Hab.* Ceylon; Hambantota, Madulsima (*Bainbrigge-Fletcher*, Brit. Mus.).

*Seliza pusana*, sp. n.

Body and legs pale castaneous brown, disk of mesonotum black; tegmina brownish ochraceous; wings fuliginous with the veins darker; head (including eyes) narrower than pronotum, centrally moderately depressed, lateral margins distinctly ridged; face a little longer than broad, centrally longitudinally carinate, the lateral margins strongly ridged; pronotum centrally bicarinate; mesonotum discally tricarinate; tegmina about twice as long as broad, costal

margin arched at base, very slightly sinuate before apex, apical angle obtusely rounded, the posterior angle moderately roundly posteriorly produced, costal membrane very slightly narrower than radial area at base of each, tegmina transversely veined from a little beyond middle to the apical cells.

Long., excl. tegm., 5 mm.; exp. tegm.  $14\frac{1}{2}$ –15 mm.

Hab. Bengal; Palamow (*D. P. S.*, Brit. Mus.).

By the shape of the tegmina this species comes nearest to *S. lignaria*, Walk., from China, but differs by the less reticulate venation to same; from the other Indian species it is to be recognized by the almost non-sinuate and more rounded apical tegminal margin.

*Ketumala sinuata*, sp. n.

Head, pronotum, mesonotum, face, and legs pale castaneous brown, abdomen and sternum paler and more ochraceous; tegmina brownish ochraceous, the claval suture paler; wings fuliginous with the veins darker; head narrower than pronotum, vertex obscurely centrally carinate, the lateral margins strongly ridged; face about as long as broad, with a short central longitudinal carination; pronotum strongly anteriorly produced, with a short obscure central carination near anterior margin; tegmina about twice as long as broad, costal margin arched at base, distinctly sinuate before apex, apical margin truncate, costal membrane much wider than radial area.

Long., excl. tegm., 4 mm.; exp. tegm. 15 mm.

Hab. Ceylon; Weligama (*Bainbrigge-Fletcher*, Brit. Mus.).

Allied to *K. bisecta*, Kirby, but the tegmina a little more elongate, considerably more sinuate before apex, and paler in coloration.

*Ketumala farinosa*, sp. n.

Body, legs, and tegmina dull pale ochraceous, the latter distinctly greyish tomentose; wings pale fuliginous with the veins darker; head (including eyes) narrower than pronotum; vertex broad, the lateral margins strongly ridged, obscurely centrally carinate; face about as broad as long, almost percurrently centrally carinate; pronotum strongly anteriorly produced; mesonotum discally tricarinate; tegmina about or nearly twice as long as broad, costal margin arched at base, moderately sinuate before apex, apical margin truncate, costal membrane much wider than radial area, clavus thickly finely granulose.



Long., excl. tegm., 5 mm.; exp. tegm. 15 mm.

*Hab.* Ceylon; Hambantota (*Bainbrigge-Fletcher*, Brit. Mus.).

By the percurrently carinate face and the greyishly tomentose tegmina this species is distinctly recognized.

*PARAKETUMALA*, gen. nov.

Allied to *Ketumala*, Dist., but differing by the face being percurrently carinate and the tegmina distinctly transversely veined on apical area as in *Seliza*.

The second character prevents its inclusion in *Ketumala* or the allied genera, whilst from *Seliza* it is separated by the short and broad face and the non-produced posterior angles of the tegmina.

*Paraketumala anomala*, sp. n.

Body and legs brownish ochraceous: tegmina dull pale ochraceous, more or less greyishly tomentose; wings pale fuliginous with the veins darker; head (including eyes) narrower than pronotum, vertex narrow, broad, anteriorly subtruncate, the anterior apices of the lateral margins a little prominent, the lateral margins strongly ridged; face about as broad as long, centrally percurrently carinate, its lateral margins amply ridged, a little narrowed towards clypeus, which is centrally carinate and obliquely striate on each lateral area; pronotum with very fine longitudinal ridges; posterior tibiae with two spines beyond middle and an apical spine; tegmina about twice as long as broad, costal margin arched at base, very slightly sinuate before apex, apical margin roundly truncate, posterior angle not produced, costal membrane much wider than radial area, the first closely transversely veined, a curved line proceeding from end of radial area to about apex of clavus, defining narrow elongate longitudinal marginal cellular areas, preceding these areas the disk is for a short distance transversely or reticulately veined.

Exp. tegm. 15 mm.

*Hab.* Bengal; Pusa (*G. S. M.*, Brit. Mus.).

*Paranotus limbatus*, sp. n.

Head, pronotum, and mesonotum virescent; abdomen above more bluish green; body beneath and legs virescent; tibiae more or less suffused with castaneous, tarsi castaneous; tegmina virescent, costal and apical margins and posterior margin from end of clavus to apex narrowly sanguineous:

wings pale bluish grey ; structural characters as in generic diagnosis.

Long., excl. tegm., 6 mm. ; exp. tegm. 19 mm.

*Hab.* Ceylon ; Horton Plains (*Green*, Brit. Mus.).

*Paranotus maculosus*, sp. n.

Allied to the preceding species *P. limbatus*, but differing in the following tegminal characters : more convexly arched at base, the apex less angulate and a little more rounded, the reddish margins more pronounced, more castaneous in hue and extending along claval margin, on disk three more or less well-defined sets of small pale brownish spots situate between the veins ; head, face, body beneath, and legs ochraceous, the tibiæ and tarsi being only faintly darker.

Long., excl. tegm., 6 mm. ; exp. tegm. 17 mm.

*Hab.* Ceylon ; Pattipola (*Green*, Brit. Mus.).

*Atracis facialis*, sp. n.

Head, pronotum, body beneath, and legs ochraceous ; abdomen above ochraceous, greyishly tomentose ; head, thorax, and face more or less finely mottled with fuscous, the mesonotum with larger piceous spots ; tegmina pale ochraceous, more or less finely mottled with piceous ; wings finely greyishly tomentose ; head (including eyes) narrower than pronotum, vertex longer than broad, in front of eyes distinctly foveate, the apex narrowed and roundly angulate ; face much longer than broad, the anterior angles of the lateral margins only obtusely prominent, the lateral angles behind anterior third amplately ridged ; clypeus obliquely finely carinate on lateral areas ; pronotum slightly shorter than vertex of head, the disk distinctly elevated and laterally ridged behind eyes, the lateral areas depressed and marginally ridged ; mesonotum about or almost as long as head and pronotum together, the disk elevated with its sides distinctly carinate ; tegmina a little more than twice as long as broad, the costal membrane quite three times as broad as radial area, costal margin slightly waved and uneven, apical margin roundly truncate.

Long., excl. tegm., 9 mm. ; exp. tegm. 20 mm.

*Hab.* Ceylon ; Wellawaya (*Green*, Brit. Mus.).

By the tegmina allied to *A. nietneri*, Stål, but a smaller species and the shape of the face very distinct ; tegmina narrower, &c.

*Atracis atkinsoni*, sp. n.

Body and legs dull ochraceous ; apical half of vertex and

apical half of face more or less spotted with black ; mesonotum with a black spot near each anterior angle, its disk mutilated in type ; tegmina greyish white mottled with ochraceous and fuscous, the fuscous shadings being distinctly confluent on apical and basal areas and transversely linear on costal membrane ; wings greyish white, subhyaline, the veins ochraceous ; vertex longer than broad, foveate, the apex broadly angulate, the lateral margins strongly amplately ridged ; face much longer than broad, the lateral margins amplately ridged, the posterior half considerably broader, the anterior half obscurely centrally carinate ; tegmina about twice as long as broad, the costal margin slightly waved and uneven, costal membrane a little more than twice as broad as radial area, which is strongly waved, a few small discal tubercles on apical third.

Long., excl. tegm., 7 mm. ; exp. tegm. 34 mm.

*Hab.* Ceylon ; Pundaluoya (Atkinson Coll., Brit. Mus.).

By the shape of tegmina and face allied to *A. moelleri*, Dist.

*Atracis haragamensis*, sp. n.

Body above pale virescent, vertex and thorax more or less mottled with castaneous ; abdomen above paler, a central line and posterior lateral fasciæ virescent ; body beneath and legs pale ochraceous, anterior margin of face picous ; tegmina pale virescent, more or less finely mottled with fuscous ; wings greyish white, subhyaline, the veins pale ochraceous ; vertex longer than broad, foveate, the apex broadly angulate, the lateral margins strongly ridged ; face much longer than broad, shortly broadly carinate on anterior area, gradually widening to area of eyes and thence more regularly continued to clypeus, the lateral margins amplately ridged ; clypeus with the lateral areas finely obliquely carinate ; tegmina about twice as long as broad, the costal margin very strongly waved and sinuate, the costal membrane more than three times as broad as radial area, apical margin roundly truncate, obsoletely finely tuberculous on apical third.

Long., excl. tegm., 9 mm. ; exp. tegm. 30 mm.

*Hab.* Ceylon ; Haragam (*Green*, Brit. Mus.).

This species by the strongly sinuate costal margin of the tegmina is allied to *A. perpleca*, Walk., and *A. cretacea*, Dist.

*Atracis greeni*, sp. n.

Body and legs ochraceous ; abdomen above with a central line and the posterior lateral areas virescent ; tegmina dull

creamy, opaque, with fuscous linear markings, which are a little more prominent in the costal membrane and apical area, the basal area faintly suffused with pale fuscous; wings creamy white, subhyaline; head narrower than pronotum, vertex longer than broad, concave, more or less granulate, the lateral margins upwardly ridged, the apex angularly rounded; face much longer than broad, its anterior area speckled with fuscous, lateral margins finely ridged, moderately sinuate to eyes, thence a little convexly broadened to clypeus, which is obscurely centrally carinate; tegmina with the costal membrane about three times broader than radial area, the costal margin moderately sinuate, apical margin roundly truncate.

Long., excl. tegm., 9 mm.; exp. tegm. 26 mm.

*Hab.* Ceylon; Peradeniya (*Green*, Brit. Mus.).

Allied to the preceding species *A. haragamensis*, Dist., but differing by the less sinuate costal margin of tegmina and the different shape of the face, colour and markings of tegmina, &c.

*Atracis sadeyana*, sp. n.

Body and legs ochraceous; mesonotum with a linear black fascia on each side; abdomen much mutilated in type, the base castaneous above; tegmina pale ochraceous with fuscous markings, of which the principal are an oblique broken fascia extending from apex of radial area to basal area of clavus, some irregular spots at and above apex of clavus and scattered minute spots round apical margin; wings dull greyish white, the veins ochraceous; head narrower than pronotum, vertex a little longer than broad, somewhat upwardly directed, moderately flat, but the lateral margins strongly ridged; face considerably longer than broad, the lateral margins subparallel and very strongly ridged, its disk smooth and moderately flattened; clypeus finely obliquely striate on each lateral area; pronotum distinctly centrally ridged; tegmina a little more than twice as long as broad, the costal margin moderately sinuate, the costal membrane at base a little more than three times broader than radial area, apical margin very roundly truncate.

Exp. tegm. 28 mm.

*Hab.* Assam; Sadeya (Brit. Mus.).

*Atracis hainanensis*, sp. n.

Head, pronotum, and mesonotum very pale virescent, very finely speckled with brownish; basal margin of vertex with two contiguous brownish spots; mesonotum with a linear



black fascia on each lateral area; abdomen above, body beneath, and legs more or less ochraceous; anterior margin of face piceous; tegmina pale virescent, with a broad slightly oblique broken fuscous fascia extending from apex of radial area to apical area of clavus, smaller and more obscure fuscous mottlings on costal membrane, apical area, and clavus; wings dull greyish, the veins somewhat ochraceous; vertex of head longer than broad, a little concave, apex narrowed and rounded, lateral margins strongly ridged; face considerably longer than broad, strongly sinuate anteriorly, thence obliquely widened to near posterior margins of eyes and afterwards slightly obliquely continued to clypeus, the lateral margins strongly ridged; clypeus obliquely striate on each lateral area; pronotum distinctly centrally carinate; tegmina about twice as long as broad, costal margin not or very slightly sinuate, costal membrane a little more than three times as broad as radial area, apical margin roundly truncate.

Long., excl. tegm., 12 mm.; exp. tegm. 31 mm.

*Hab.* Hainan; Mangrin (Brit. Mus.).

#### SYNONYMICAL NOTES.

Genus *NEOALARDUS*, n. nom.

*Alardus*, Dist. Ann. & Mag. Nat. Hist. (7) xii. p. 475 (1903), nom. preocc. (Busch, 1851).

Type, *N. typicus*, Dist. (*Alardus*).

Genus *BARUNOIDES*, n. nom.

*Baruna*, Dist. Faun. B. I., Rhynch. iii. p. 283 (1906), nom. preocc.

Type, *B. albosignata*, Dist. (*Baruna*).

#### XLIX.—*Descriptions of new Species of Voluta, Latiaxis, and Calliostoma from Japan.* By G. B. SOWERBY, F.L.S.

*Voluta hirasei*, sp. n. (Fig. 1.)

Testa fusiformis, crassiuscula, pallide fulvescens; anfractus 8, embryonales graciles, lævigati, sequentes convexi, longitudinaliter costati, spiraliter conspicue rugoso-striati; sutura albo callosa; anfractus ultimus  $\frac{2}{3}$  longitudinis testæ æquans, superno concavo-constrictus, deinde convexus, basin versus attenuatus, undique transversim lirato-striatus: striis confertis, rugoso subgranulatis; apertura oblonga, mediocriter lata, utrinque acuminata, intus

albida, ad limbum flavidula; peristoma simplex, leviter incrassata, postice late sinuata; columella rectiuscula, biplicata, plicis perobliquis, postica vix conspicua.

Long. 156, lat. 55 mm.

*Hab.* Kii, Japan.

This shell differs from *V. prevostiana*, Crosse, principally in its strongly pronounced rough spiral sculpture; it is also of a uniform pale colour, without any of the colour-markings which adorn that species.

The specimen (the only one I have seen) has the appearance of having been taken alive, as the interior of the aperture is quite lustrous.

Fig. 1.



Fig. 2.



Fig. 3.



Fig. 1.—*Voluta hirasei*.  $\frac{1}{2}$  nat. size.

Fig. 2.—*Latiavis armatus*. Nat. size.

Fig. 3.—*Calliostoma aculeatum*. Magnified.

*Latiavis armatus*, sp. n. (Fig. 2.)

Testa abbreviato-fusiformis, alba; spira acute pyramidata; anfractus 8, angulati, spiraliter dense lirati, minute squamati, ad angulum muricati; ultimus supra angulum subplanato declivis, ad angulum squamis elongatis angustis oblique erectis armatus, infra angulum convexus, paulo infra medium contractus; umbilicus angustus,

costa sinistra obliqua squamosi marginata; apertura ovata; columella tortuosa; canalis medioeriter productus, leviter arcuatus.

Long. 28, diam. 16 mm.

*Hab.* Kii, Japan.

This strikingly beautiful shell, though having points of resemblance, may be very readily distinguished from its congeners. Compared with *L. deburghie*, Reeve, it is much more elevated and acute, and the produced scales or spines at the angle are much narrower and more erect. Compared with *L. diadema*, A. Adams, it has no second angle or armed keel below the periphery, where it is convexly rounded, and the spines at the angle are not hooked, but obliquely erect and sharp.

*Calliostoma aculeatum*, sp. n. (Fig. 3.)

Testa conico-pyramidalis, pallide straminea et grisea, fusco maculata; spira elata, acuta; anfractus 9, convexi, leviter biangulati, undique liris angustis densissimis inæqualibus pulcherrime aculeato-granulosis fusco articulatis spiraliter sculpti; liris 2 majis conspicuis; anfractus ultimus latiusculus, parce triangulatus; basis leviter convexa, dense lirata, liris fusco articulatis; columella oblique rectiuscula, albo, callosa; umbilicus clausus; apertura subquadrata, intus margaritacea; peristoma tenue, serratum. Alt. 22, lat. 21 mm.

*Hab.* Kii, Japan.

A beautifully sculptured species, somewhat resembling *C. consors*, Lischke, but with a higher, more acute spire; and while that species is comparatively smooth, this is closely covered with narrow ridges of unequal size, but all densely beaded with sharp prickly scales or nodules.

L.—A Revision of the Asilidæ of Australasia.

By GERTRUDE RICARDO.

IN a collection of Diptera sent me several years ago by Mr. French from the Melbourne Museum, for determination, were a certain number of Asilidæ. In attempting to name them I found great confusion in the nomenclature of the species, and of their generic place, from Australia. The following paper is an attempt to clear up some of these errors, but no doubt there will still be much to revise when more material is available. The majority of the old species were described by Macquart and Walker, who both worked at about the same time—Walker from 1849–1856 and Macquart from 1838–1855; in consequence there are very

many synonyms between these two authors. Since then a few species have been described by Schiner and Thompson, and a few older ones were described by Wiedemann and Fabricius.

Most of Macquart's species have been seen by me in the Paris Museum through the kindness of M. Bouvier, and in especial of M. Surcouf, and compared with Walker's species in the Brit. Mus. Coll.

The pagination here used for Macquart's Dipt. Exot. is that of the original work, first published in Mém. Sci. Agri. et Arts de Lille, 1838–1855; the one usually used is unfortunately that of the reprint, which did not retain the original pagination. Priority is given to Macquart's names over those of Walker as a rule, as the descriptions appear the best. Williston and Hine are followed in placing the genus *Leptogaster* in a separate subfamily and in the arrangement of the subgenera of *Asilus*.

The species from Australia, New Zealand, and Tasmania only, are described; those from other parts of the Australasian Region are, as a rule, merely given with their references. Judging from Walker's species, not many of the species of the continent extend beyond it.

All types are in the British Museum Coll. unless otherwise specified.

#### Asilidæ.

- |  |                          |
|--|--------------------------|
| 1. Marginal cell of wings open .....   | 2.                       |
| Marginal cell of wings closed.....   | 3.                       |
| 2. Antennæ with a slender terminal arista. Very slender species .....                          | <i>Leptogasterinae</i> . |
| Antennæ with no slender terminal arista, but with or without a terminal style or bristle ..... | <i>Dasypogoninae</i> .   |
| 3. Antennæ with a terminal bristle .....   | <i>Asilidæ</i> .         |
| Antennæ usually without a terminal bristle .....   | <i>Laphrinae</i> .       |

#### LEPTOGASTER, Meigen.

Illiger's Magazine f. Ins. ii. p. 269. 53 (1803).

*Gonypes*, Latr. Hist. Nat. d. Crust. et d. Ins. xiv. p. 309. 477 (1804).

The following species are recorded from Australasia:—

*Leptogaster geniculatus*, Macq., Dipt. Exot. Suppl. 4, p. 400, pl. ix. fig. 6 (1849). [*Leptogaster pedanius*, Walker, List Dipt. ii. p. 484 (1849), et vii. Suppl. 3, p. 774 (1855).]

*Leptogaster antipoda*, Bigot, Ann. Soc. Entom. France, (5) viii. p. 445 (1878).

To these are here added three new species—*L. australis*, *bancrofti*, *dissimilis*.

*Leptogaster geniculatus*, Macq.

*Leptogaster pedanius*, Wlk.

Macquart's type seen in Paris Museum, 12. 4. 11, a male from Tasmania.



Walker's type a male from New South Wales.

In Brit. Mus. Coll. are females and a male from Burpengary, S. Queensland (*T. L. Bancroft*), 1904.

A small species, with clear wings, yellowish legs, thorax and abdomen black.

Length 9-10 mm.

In Macquart's type the *legs* are somewhat darker than in those of Walker's type. The first two joints of the *antennæ* in Macquart's type are reddish, not black as stated, and the small transverse vein of the *wing* is in the middle of the discal cell, not very near the base as shown in figure.

Macquart's description is as follows:—

Length 5 lines. ♂.

Palpi with white hairs. Beard and moustache white; face with yellowish tomentum. Forehead brown. Antennæ: the first two joints black (in reality reddish), the third wanting. Abdomen: anterior and posterior borders of segments ashy grey. Legs fawn-coloured, with coxæ grey; some black colour on the anterior and middle legs; posterior legs wanting. Wings clear. From Tasmania.

To this the following particulars may be added:—*Thorax* greyish, with three black short stripes. Knees of *legs* narrowly black, apices of tarsi also black; bristles on the last four tarsi and on the apex of the first hind tarsus black, elsewhere pale yellowish. The small cross-vein of the *wing* is at or slightly below the middle of discal cell and the fourth posterior cell is pedunculated at its base; the cross-vein closing the second basal cell joins the pedunculated part at about the middle. The wings are shorter than the body, measuring 5-6 mm.

### *Leptogaster antipoda*, Bigot.

From Tasmania.

Described as having testaceous legs, the posterior femora widely brown at base, with another narrower brown band before the apex.

### *Leptogaster bancrofti*, ♂ ♀, sp. n.

Type (♂) from Mr. French's Coll., Victoria (1898).

Type (♀) from Queensland (1909) (*Dr. Bancroft*).

A black species with yellowish legs, but the hind legs darker, almost wholly black. Wings clear, the small cross-vein at the middle of discal cell, and the cross-vein closing second basal cell also joining the stalk of fourth posterior cell at about the middle. Length 12 mm.; wings 6-7 mm. *Face* covered with greyish tomentum, the moustache yellow. *Antennæ* black. *Forehead* the same as face. *Thorax* reddish

brown or reddish grey, with a median and lateral black stripes, sides of thorax ashy grey. *Abdomen* black, with well-marked grey segmentations. *Legs* reddish yellow, the knees of fore legs and joints of tarsi black; the posterior femora blackish on apical half, the extreme apex red; the posterior tibiae almost wholly blackish; the first joint of hind tarsi pale yellow, black at its apex, and the other joints chiefly black; bristles of tarsi black, except on the first joint, where they are yellowish.

*Leptogaster australis*, ♂, sp. n.

Type (♂) and another from Townsville, Queensland (F. Dodd), 1903.

A species distinguished from *L. geniculatus*, Macq., by its larger size, by the reddish-brown thorax with one median black stripe, and by the cross-vein closing the second basal cell joining the peduncle of the fourth posterior cell at two-thirds of its length.

Length 14 mm.

*Face* covered with silvery-grey tomentum, the scanty moustache pale yellow. *Antennae* black, the first two joints reddish. *Forehead* yellowish above the antennae, black at the vertex. *Thorax* reddish brown, with greyish tomentum on dorsum, bordering the black stripe, which does not reach the posterior border: sides covered with yellowish tomentum, breast reddish brown; *scutellum* same colour as thorax. *Abdomen* obscurely yellow, covered with grey tomentum: the last three segments blackish, with very fine whitish pubescence; genitalia reddish; underside blackish. *Legs* reddish yellow, the first joint of the tarsi paler, almost white, the remaining joints reddish brown; knees black and the apical two-thirds of the hind tibiae are reddish brown; tibiae with scattered white bristles; pubescence on legs very slight, most noticeable on the hind pair, where it is almost wholly white; coxae reddish brown, with white tomentum. *Wings* hyaline, tinged with brown on the basal half; this is hardly noticeable in the second male; all cells open; the cross-vein at or beyond the middle of discal cell. Halteres yellow.

*Leptogaster dissimilis*, ♀, sp. n.

Type (♀) and another from Stannary Hills, N. Queensland, about 3000 feet (Dr. T. L. Bancroft), 1909; and another female from Queensland from the same collector.

A handsome species, distinguished by the reddish-yellow legs marked with black on the knees, and with the apical half of the club-shaped hind femora deep black: the apices of tibiae, the hind pair widely, black.

Length 16 mm.

Face greyish yellow, the scanty moustache pale yellow. *Antennae* black, the second joint reddish. *Forehead* darker than face. *Thorax* reddish brown, blackish in the centre, sides with yellowish tomentum. *Abdomen* blackish, the first four joints almost wholly reddish yellow, in the other female not so distinctly so, only the first two joints being dull yellowish. *Legs* reddish yellow; the knees, apical half of hind femora, apices of tibiae, and all the tarsi except the first joint black. *Wings* tinged yellow at base, the small cross-vein about the middle of discal cell, the cross-vein closing the second basal cell joins the stalk of fourth posterior cell at two-thirds of its length.

This species is distinguished from *Leptogaster bancrofti* by its larger size, the yellow base of abdomen, the yellow tomentum on sides of thorax, the posterior tibiae less widely black, and by the situation of the cross-vein closing second basal cell.

The following species are recorded from other parts of the Australian Region :—

- L. albimana*, Wlk., from Aru.—Type in B. M. Coll., much damaged. Hind legs with black or brown bands. Röder records it from Ceylon.
- L. annulipes*, Dol., from Amboina.
- L. angelus*, Ost.-Sack., from Celebes.
- L. exacta*, Wlk., from New Guinea.—Type in B. M. Coll.; also with brown bands on the hind legs.
- L. ferruginea*, Wlk., from Aru.—Type in B. M. Coll.; also with black or brown bands on the hind legs.
- L. fulvipes*, Bigot, from New Guinea.
- L. habilis*, v. d. Wulp, from Timor.
- L. hirticollis*, v. d. Wulp, from Timor.
- L. inflata*, Ost.-Sack., from Celebes.
- L. longipes*, Wlk., from Aru.—Type in B. M. Coll.; much damaged, with very slender legs.
- L. magnicollis*, Wlk., from Ceram.—Type in B. M. Coll.; a very large robust yellowish species.
- L. moluccana*, Dol., from Amboina.
- L. munda*, Wlk., from Celebes.—Type in B. M. Coll.; bands present on hind legs.
- L. tarsalis*, Walk., from Bujan and Ceram.—Type in B. M. Coll., with brownish legs, the first joint of tarsi white.
- L. unicolor*, Dol., from Amboina.
- L. varipes*, v. d. Wulp, from Padang.

All the Walker types have the fourth posterior cell pedunculated. From a cursory examination of the descriptions of species of the other authors these types do not appear to be identical with any.

#### DASYPOGONINÆ.

The following genera are represented in the Australasian Region :—

*Damalis*, Fabr.; *Acnephalum*, *Codula*, *Microstylum*, *Brachyrrhopala*, Macquart; *Cabasa*, *Phellus*, Walker; *Bathypogon*, *Saropogon*, *Stenopogon*, *Stichopogon*, Loew; *Chrysopogon*, Röder; *Deromyia*, Philippi. New genera added: *Neocyrtopogon*, *Neosaropogon*, *Psilozona*, *Rachiopogon*. Of doubtful occurrence the following: *Ancylorhynchus*, Latr.; *Selidopogon*, Bezzi.

### Table of Genera.

1. Fore tibiae with a curved spine .....	2.
Fore tibiae with no such curved spine ....	10.
2. Third joint of antennæ usually with no very distinct terminal style .....	3.
Third joint of antennæ with a distinct terminal style .....	9.
3. Thorax humpbacked, bright-coloured. All posterior cells open. Small species ....	<i>Cabasa</i> , Wlk.
Thorax not humpbacked or bright-coloured. Posterior cells not always open .....	4.
4. Thorax armed with a stout spine on each side .....	<i>Chrysopogon</i> , Röder.
Thorax not armed with a stout spine on each side .....	5.
5. Abdomen club-shaped, narrower at base ..	<i>Brachyrrhopala</i> , Macq.
Abdomen not club-shaped nor narrower at base .....	6.
6. Face very convex .....	<i>Neocyrtopogon</i> , g. n.
Face not very convex .....	7.
7. Antennæ notched at apex of third joint ..	<i>Rachiopogon</i> , g. n.
Antennæ not notched at apex of third joint.	8.
8. Fourth posterior cell narrowed at border or open .....	<i>Neosaropogon</i> , g. n.
Fourth posterior cell closed far from border .....	<i>Deromyia</i> , Philippi.
9. Fourth posterior cell open or closed. Small species .....	<i>Saropogon</i> , Loew.
10. No pulvilli to tarsi. Hairy species, bee-like in appearance .....	<i>Acnephalum</i> , Macq.
Pulvilli present. Species not hairy or bee-like in appearance .....	11.
11. Second posterior cell encroaching on the first cell .....	<i>Microstylum</i> , Macq.
Second posterior cell not encroaching on the first cell .....	12.
12. Very large species. Middle tibiae with a stout prolongation .....	<i>Phellus</i> , Walk.
Not very large species. Middle tibiae simple .....	13.
13. Abdomen club-shaped. Moustache confined to oral opening .....	<i>Codula</i> , Macq.
Abdomen not club-shaped. Moustache not always confined to oral opening ....	14.
14. Moustache reaching antennæ. Face with a tubercle .....	15.
Moustache not reaching antennæ. Face with no tubercle .....	16.



15. Face fairly broad, with tubercle nearly reaching the antennæ. Fourth posterior cell closed, in a parallel line or nearly so with the vein closing discal cell . . . . . *Bathypogon*, Loew.  
 Face very narrow, and narrower at antennæ, with a heel-shaped tubercle reaching nearly to the antennæ. Fourth posterior cell closed or narrow, not parallel with discal cell . . . . . *Stenopogon*, Loew.
16. Blue-black shining species. Fore and middle tibiae fringed with hairs . . . . . *Psilozona*, g. n.

### CABASA, Walk.

Dipt. Saund. i. p. 100 (1851); id., List Dipt. pt. vi. Suppl. 2, p. 499 (1854); Schiner, Verh. zool.-bot. Ges. Wien, xvi. pp. 652, 653, 703 (1866).

This genus was formed by Walker for one species from Tasmania, *Cabasa rufithorax*, which he later stated was a variety of *Dasypogon pulchellus*, Macq.; the second species from the same locality, which he named *Dasypogon venno*, had likewise been described previously by Macquart under *Dasypogon*.

The genus is allied to *Brachyrrhopola*, but easily distinguished by the humpbacked thorax. Schiner did not include it in his table. Walker omitted any mention of the presence of the curved spine on fore tibiae, which is very distinct in the known species, which are small, the thorax bright-coloured, the abdomen blackish, the wings brownish. The antennæ long, the third joint nearly twice as long as the first two together.

The species as yet recorded in the genus are four, only the first two being from Tasmania, the others from Batchian and Aru Island.

*Cabasa pulchella*, Macq., Dipt. Exot. Suppl. i. p. 190, pl. vii. fig. 9 [*Dasypogon*] (1844). *Cabasa rufithorax*, Walker, Dipt. Saund. i. p. 100 (1851).

*Cabasa rubrithorax*, Macq., Dipt. Exot. Suppl. 4, p. 370 [*Dasypogon*] (1849). *Dasypogon venno*, Walker, List Dipt. ii. p. 359 (1849), et vi. Suppl. 2, p. 500 (1854).

*Cabasa honesta*, Walker, Proc. Linn. Soc. London, iii. p. 83 [*Dasypogon*] (1859), et v. p. 277 [*Dasypogon*] (1861).

*Cabasa glabrata*, Walker, Proc. Linn. Soc. London, v. p. 277 [*Dasypogon*] (1861).

### *Cabasa pulchella*, Macq.

*Cabasa rufithorax*, Walker.

Macquart's type is in the Paris Museum, seen by me, 12. 4. 11, apparently a female.

Walker's type is identical, a female from Tasmania; others in Brit. Mus. Coll. from Hobart (*J. J. Walker*), a

male from Mackay, Queensland (*G. Turner*), and a specimen from Dandenong Ranges, Victoria, in Mr. French's Coll.

Macquart's description is as follows:—

Thorax red. Abdomen violet (♂), black (♀). Moustache black. Antennæ and legs black. Wings brown. Length 5 lines, ♂ ♀. Palpi black, with black hairs.

Face shining black, with white tomentum at the sides; moustache plain, black. Forehead shining black. Antennæ: third joint fairly long, curved outwardly. Thorax shining red; with a black dorsal elongated spot, another at the base of wings, and one small black spot on shoulders. Scutellum black. Abdomen a brilliant violet (♂), black with green reflections (♀). Legs: anterior legs with small spine. Halteres yellow. Wings brown. In two specimens the male has the second posterior cell stalked; the female has it slightly so in the right wing, on the left one with no stalk but pointed at the base.

From Tasmania.

An easily recognized species.

### *Cabasa rubrithorax*, Macquart.

*Dasypogon venno*, Walker.

Macquart's type (♂) seen in Paris Museum, 12. 4. 11. Walker's type is identical with it.

Walker's type (♂ or ♀?) from Van Diemen's Land.

The species is only distinguished from *Cabasa pulchella* by the *wings*, which are brown on the basal half only as far as the apex of the discal cell, and is rather smaller in size.

Macquart's description is as follows:—

Length 3 lines, ♂. Face and forehead black, with grey tomentum; moustache plain, yellowish. Antennæ: the first two joints black, the third is wanting. Thorax shining red, with a dorsal band and its posterior border blackish green; chest and scutellum black. Abdomen depressed, shining black, with faint green reflections. Legs black, almost naked; posterior tibiae swollen at apex. Halteres fawn-coloured, large, becoming wider from base to apex. Wings: the two anterior thirds brown; the remainder hyaline; neuration normal.

From Tasmania.

### *Cabasa glabrata*, ♂, Walker.

Type (♂) from Batchian.

This type and the following one Walker failed to recognise as belonging to the above genus created by himself.

It differs from *C. rubrithorax* and *C. pulchella* by its

wholly yellow legs, only the tarsi becoming brownish. *Thorax* and breast-sides the same colour as legs. *Abdomen* black. *Wings* pale brownish.

*Cabasa honesta*, ♀, Walker.

Type (♀) from Aru Island.

Distinguished by the colouring of the legs from the other species. *Legs* black, the coxæ, the extreme apices of femora, and the tibiae (with the exception of the apices) reddish yellow. *Antennæ* black. *Thorax* black, but covered with brownish-yellow tomentum; breast-sides the same, with a broad shining reddish-yellow stripe. *Abdomen* blue-black, with narrow testaceous posterior borders.

### CHRYSOPOGON, Röder.

Berlin. ent. Zeit. xxv. p. 213 (1881); id., Stett. ent. Zeit. liii. p. 243 (1892).

Founded for *C. crabroniformis*, Röder; *C. mülleri*, Röder, was added in 1892. The author distinguishes the genus from *Laparus*, Loew (now *Neolaparus*), by the stout spine on each side of the *thorax* and by the closed or very much narrowed first posterior cell; this last distinction will not hold good, as two of the species now added to this genus both have the cell open, but possess the stout spine on the thorax which will serve to divide the genus from *Neolaparus*. *Dasypogon albopunctatus*, Macq., of which *Dasypogon spinther*, Wlk., is a synonym, was placed by Schiner under *Neolaparus*, but belongs to this newer genus.

The genus will now include the following species:—

*C. albopunctatus*, Macq., Dipt. Exot. Suppl. 1, p. 193, pl. vi. fig. 7 [*Dasypogon*] (1846); Schiner, Verh. zool.-bot. Ges. Wien, xvi. p. 700 (1866), et xvii. p. 369 [*Dasypogon*] (1867). *Dasypogon spinther*, Walker, List Dipt. ii. p. 337, et vi. Suppl. 2, p. 478 (1854).

*C. crabroniformis*, Röder, Berlin. ent. Zeit. xxv. p. 213 (1881).

*C. mülleri*, Röder, Stett. ent. Zeit. liii. p. 243 (1892).

*C. fasciatus*, sp. n.

*C. punctatus*, sp. n.

*C. queenslandi*, sp. n.

*C. splendidissimus*, sp. n.

1. First posterior cell closed or narrower.  
     Wings yellowish ..... 2.  
     First posterior cell open, hardly narrower.  
     Wings brownish or hyaline ..... 3.
2. Abdomen reddish yellow, with black spots.  
     Antennæ yellow. Legs red, the femora  
     black ..... *splendidissimus*, sp. n.  
     Abdomen black, with transverse yellow  
     spots. Antennæ black. Legs red .... *mülleri*, Röder.

Abdomen reddish yellow, the base and third and fourth segments black . . . . .	<i>crabroniformis</i> , Röder.
3. Abdomen black, with golden-yellow narrow bands . . . . .	<i>fasciatus</i> , sp. n.
Abdomen reddish yellow, base and fourth segment black . . . . .	<i>albopunctatus</i> , Macq.
Abdomen yellowish, with broad black bands on each segment . . . . .	<i>queenslandi</i> , sp. n.
Abdomen black, with white spots . . . . .	<i>punctatus</i> , sp. n.

*Chrysopogon albopunctatus*, Macq.

*Dasyopogon spinther*, Walker.

Type of *D. spinther*, Wlk., a male from W. Australia (*Clifton*), and other specimens from Freemantle (*J. J. Walker*) and Champion Bay, W. Australia (*Du Boulay*).

Walker's type agrees with the description given by Macquart, but in common with the other specimens it has a narrow black band on the posterior half of the second segment, which is also narrowly black anteriorly, and the femora have a black band on the upper sides in Walker's type and some of the specimens.

Macquart's type is not to be found in the Paris Museum.

Macquart's description is as follows:—

Thorax with testaceous tomentum, white-spotted. Abdomen testaceous, with white spots; the base and the fourth segment black. Moustache yellow. Legs testaceous. Wings reddish.

Length 9 lines (♀). Face with golden tomentum and moustache pale yellow. Antennæ: the first two segments testaceous, the third wanting. Forehead black, anteriorly with golden tomentum. Thorax with reddish-brown tomentum; spots on shoulders white tomentose, as well as two small spots at base of wings; sides with a transverse band of golden tomentum and two similarly coloured spots on each side of it; scutellum testaceous; a golden tomentose spot on each side of the metathorax. Abdomen: first segment black, second and third testaceous, fourth and anterior border of fifth black; rest of abdomen testaceous; a small yellowish-white tomentose spot on each side of the second, third, and fourth, on the posterior border. Legs testaceous, with a spine. Wings reddish; the centre of cells almost clear, the fourth posterior cell open.

New South Wales (*MM. Guérin, Reiche*).

The species is easily recognized by the yellowish abdomen with black bands; Macquart overlooked the spine on thorax. The third joint of antennæ is the same colour as the others, but twice as long as the two together, narrow, cylindrical. Wings brownish yellow on fore border, the first and fourth



posterior cells open but narrower at border, the small transverse vein beyond the middle of discal cell.

*Chrysopogon crabroniformis*, Röder.

In Brit. Mus. Coll. one female from Queensland.

Röder created the genus for this species.

A handsome black and fulvous insect, with a stout *abdomen* fulvous at base and apex, with a broad black band on the third and fourth segments. *Legs* fulvous. *Face* golden yellow, with a yellow moustache. *Wings* golden yellowish, dark brown at apex and pale brown on posterior border; the first posterior cell closed far from border, the fourth open, the anal cell not quite closed.

Length 20 mm.

*Chrysopogon mülleri*, Röder.

Described as black. Length 29–30 mm. From Victoria.

*Face* with yellow tomentum. Moustache pale yellow. *Antennæ* black. *Thorax* brownish, with three darker median stripes, with pale yellowish triangular spots on the shoulders, suture, and posterior border, and at apex of *scutellum*, the spine on each side of thorax is present. *Abdomen* at base pitchy black, from the third segment yellow, bordered on each segment with black, leaving yellow spots, which are small on the third, then larger, leaving only a black spot on the sixth segment. *Legs* very stout, deep red; tibiae at apices darker. *Wings* tinged yellowish, with reddish veins; first posterior cell closed or very narrow.

*Chrysopogon fasciatus*, ♂ ♀, sp. n.

Type ♂ ♀, both from Mackay, Queensland (G. Turner).

A species with black golden-banded abdomen, red legs and antennæ, and greyish-brown wings; all posterior cells and the anal cell open.

Length, ♂ 17, ♀ 15 mm.

Black. *Face* covered with grey tomentum and greyish or yellowish short pubescence; moustache composed of only a few yellowish or whitish bristles. *Palpi* reddish, with some coloured pubescence. *Antennæ* reddish yellow, long; the first joint a little longer than the second, both with reddish-yellow hairs; third joint slender, nearly twice as long as the first two. *Forehead* black, with a few reddish-yellow hairs at sides. *Thorax* black, with some short fulvous tomentum on dorsum; shoulders and sides with golden tomentum; prothorax with a yellowish pubescent stripe, and thorax with similar stripes three in number; scutellum black, with

golden tomentum. *Abdomen* same width throughout, black, punctuated, the first segment black, the second and third with narrow golden tomentose bands posteriorly, the fourth and fifth with the same and with traces of another one on their anterior borders, the sixth almost wholly covered with golden tomentum; underside black, with broad greyish-yellow tomentose bands; genital organs of male not protruding, ovipositor of female developed on underside. *Legs* stout, red; coxæ black, with greyish tomentum; tarsi slightly brown; fore tibiæ with the curved spine black, posterior tibiæ swollen at apex. Halteres yellow. *Wings* brownish in male, greyish brown in female, paler at base, veins on fore border and at base yellow, elsewhere brown ♀, brown in ♂; first posterior cell open, not narrower at border; anal cell very narrow at border, small transverse vein just beyond the middle of discal cell. In spite of the first posterior cell being open, this species clearly belongs to the genus, having the spine on the thorax very stout and black.

*Chrysopogon punctatus*, sp. n.

Type (♂) and another from S. Queensland (*Dr. T. L. Bancroft*), 1908.

A handsome small black species marked with white spots. Legs black. Wings deep brown.

Length 12 mm.

*Face* covered with silvery-grey tomentum and with a central deep black stripe. Moustache of pale yellow bristles. Proboscis black, large. *Palpi* black, with black hairs and some white ones at base. *Antennæ* black, the third joint wanting. *Forehead* black. Prothorax, thorax, breast, and scutellum black. *Thorax* with four small spots, sides and base, stripes on breast and scutellum wholly, with glistening white tomentum. *Abdomen* black, same coloured spots on side of each segment. *Legs* black, the coxæ with glistening white tomentum. *Wings* brown, paler on hind border, and first posterior cell almost wholly hyaline.

*Chrysopogon queenslandi*, sp. n.

Type (♂) from Queensland (*C. M. Kelsall*), 1910; type (♀) from Queensland (*F. P. Dodd*), 1907.

A small yellow-and-black species, abdomen and legs short and robust. Prothorax much developed. Head as wide as thorax. Wings with all posterior cells open.

Length 14 mm.

*Male*.—*Face* blackish, with silvery-grey tomentum; moustache of pale yellow bristles arranged round oral

opening. *Palpi* blackish, with paler hairs. *Antennæ* reddish yellow; the first two joints small, with a few yellow hairs and black bristles on apex of second joint on lower border; the third joint bare, cylindrical, almost twice as long as the first two joints together; the small spine distinct, the style blunt, blackish. *Forehead* shining black in the centre. Hind border of head armed with two bristles, the short hairs round head are yellowish. *Prothorax* black. *Thorax* blackish brown, with grey tomentum; three black stripes visible; shoulders and sides covered with golden tomentum; breast black, with glistening white tomentum and with two shining blue-black stripes, the first one opposite the first pair of legs, the second one, which is blacker and subdivided, below the base of wings; the stout spine is black, placed just above the base of wings. *Scutellum* covered with golden-yellow tomentum. *Abdomen* yellow, black at base, and with broad black bands on anterior border of segments; on sides of segments a tomentose square grey spot appears. *Legs* reddish yellow; *coxae* black, with grey tomentum; femora largely black; apices of tibiae and the tarsi reddish brown or blackish. *Wings* clear, the first posterior cell a little narrower at opening; anal cell not quite closed; genital organs small.

*Female* similar to the male, but the dark bands on abdomen are wider and blue-black; ovipositor large, black. Legs more largely reddish.

A female from West Australia is probably a specimen of this species, though the black bands on abdomen are almost wholly obsolete.

*Chrysopogon splendidissimus*, ♂ ♀.

Type ♂, type ♀, and another male, all from West Australia; the males from Champion Bay (*H. Du Boulay*) and the female from W. Australia (*G. Clifton*).

A large handsome species with a reddish-yellow thorax and abdomen, the latter black at its base and on the sides of the third and fourth segments, underside black; antennæ and legs yellowish, femora black. Wings yellow, grey at apex and on inner border, the first posterior cell closed.

Length, ♂ 23–30 mm.; ♀ 23 mm. without ovipositor.

Fulvous. *Face* wrinkled, reddish with golden tomentum; the moustache composed of golden-coloured bristles bordering the mouth. *Palpi* reddish yellow with yellow hairs. The hairs round head above and below black. *Antennæ* reddish yellow, the first two joints with yellow pubescence; the third joint twice as long as the first two, with a short

rudimentary end style. *Forehead* same colour as face. *Thorax* black, reddish yellow on the dorsum, with golden tomentum, the spine reddish yellow; *scutellum* black. *Abdomen* the same width throughout: the first segment and anterior border of second black, shining; the third with an isosceles triangular black spot at each side, the apices extending nearly to the middle of the segment along the posterior border; on the fourth there is a similar but ill-defined smaller spot in the female type, in the males the sides of the fourth and fifth segments are narrowly black, pubescence on dorsum chiefly fulvous, on the sides of abdomen black; underside wholly black; ovipositor of female short, fulvous; genital organs of male small, almost hidden, fulvous. *Legs* same colour as greater part of abdomen, the coxæ and femora shining black, with black pubescence. *Wings* yellowish, with yellow veins tinged with grey at apex and on inner border, all posterior cells except the first widely open, the anal cell open, but very narrow, at border, small transverse vein just beyond the middle of discal cell. Halteres yellowish.

The *antennæ* in this species and in *C. queenslandi* have the small style on the lower border of the third joint, and the upper border is excised and armed with a small spine. In the other species the end of joint seems broken off. Probably this characteristic will prove generic; the genus, however, is easily distinguished by the spine on thorax.

#### BRACHYRRHOPOLA, Macquart.

Dipt. Exot. Suppl. ii. p. 51 (1847).

This genus was formed by Macquart for his species *B. ruficornis*, from Tasmania, to which, later, a second species was added by Röder, originally named by Macquart *Dasypogon maculinervis*; and Professor Röder added two new species, one of which, however, is a synonym of a species erroneously placed by Macquart under *Codula*, who also had described one species earlier under *Dasypogon* which belongs to this genus.

The genus belongs to the group with a curved spine at end of fore tibiæ, and is characterized by the club-shaped abdomen and the wings with all posterior cells and the anal cell open. *Antennæ* hardly the length of head as Macquart states; the first joint a little long, the second short, the third three times as long as the first joint, nearly straight above, a little convex below, and attenuated at the base: Bigot in his description of the type (*sic*) of *B. maculinervis*



which he sent to Prof. Röder (see Wien. ent. Zeit. ii. p. 273) speaks of them as two and a half times as long as the head. *Legs* newly naked, posterior femora with a few small bristles, the posterior tibiæ swollen at apex.

The following are the species as yet recorded in this genus, all from Australia and Tasmania :—

- B. limbipennis*, Macq., Dipt. Exot. Suppl. i. p. 190, pl. vii. fig. 8 [*Dasy-pogon*] (1844). *B. maculinervis*, Macq., Dipt. Exot. Suppl. iv. p. 369, pl. vi. fig. 8 [*Dasy-pogon*] (1849); Röder, Stett. ent. Zeit. liii. p. 242 (1892). *Dioctria tasmanica*, Walker, Dipt. Saund. i. p. 85 (1851), et List Dipt. vi. Suppl. 2, p. 388 (1854).  
*B. nitidus*, Macq., Dipt. Exot. Suppl. i. p. 189 [*Dasy-pogon*] (1844).  
*B. ruficornis*, Macq., Dipt. Exot. Suppl. i. p. 52, pl. i. fig. 7 (1846). (Type of genus.) Röder, Wien. ent. Zeit. ii. p. 273 (1883) et Stettin. entom. Zeit. liii. p. 242 (1892); Froggatt, Australian Insects, p. 302 (1907).  
*B. fenestrata*, Macq., Dipt. Exot. Suppl. iv. p. 374, pl. vii. fig. 2 [*Codula*] (1849). *B. victoriae*, Röder, Stett. ent. Zeit. liii. p. 242 (1892).  
*B. maculata*, Röder, Wien. ent. Zeit. ii. p. 274 (1883), et Stett. ent. Zeit. liii. p. 242 (1892).  
*B. fulva*, sp. n.

- |  |                            |
|--|----------------------------|
| 1. Wings hyaline, tinged yellow on fore border;<br>abdomen and legs red .....          | <i>nitidus</i> , Macq.     |
| Wings brownish, hyaline in centre .....  | 2.                         |
| Wings hyaline, brown at base .....   | 3.                         |
| Wings hyaline, brown on the fore border .....  | 4.                         |
| Wings anteriorly golden, with a transverse brown<br>band .....                         | 5.                         |
| 2. Abdomen black with narrow yellow bands ....   | <i>fenestrata</i> , Macq.  |
| Abdomen reddish yellow, black at base and with<br>black bands on apical segments ..... | <i>fulva</i> , sp. n.      |
| 3. Abdomen black with yellow bands .....   | <i>ruficornis</i> , Macq.  |
| 4. Abdomen reddish brown or blackish brown ....  | <i>limbipennis</i> , Macq. |
| 5. Abdomen ochraceous, with the fourth segment<br>and spots black .....                | <i>maculata</i> , Röder.   |

### *Brachyrrhopola limbipennis*, Macq.

*Brachyrrhopola maculinervis*, Macq. [*Dasy-pogon*].

*Dioctria tasmanica*, Walker.

Type of *B. limbipennis*, ♀, Macq., seen in Paris Museum, 12. 4. 11, is a male, not a female as on label and in description, identical with a specimen of *D. tasmanica*, and comes from Tasmania.

The type of *B. maculinervis*, described as a mutilated headless female, appears from the description and the figure of the wing to be identical with Macquart's earlier species.

In Brit. Mus. Coll.: type of *D. tasmanica*, a male, from Tasmania, and a male and female from Melbourne (*French*); others from Burpengary, S. Queensland (*Dr. T. L. Bancroft*),

and from Hobart (*J. J. Walker*). In Mr. French's coll. specimens from Victoria.

A species easily recognized by the dark colouring on fore border of wing. Reddish brown, with two yellowish narrow segmentations on abdomen.

Type (♂) 12 mm. Bigot gives 18–21 mm. for *B. maculineris*. Specimens range from 12–20 mm.

*Face* covered with greyish or yellowish tomentum, and with two black shining stripes starting together from below the antennæ and becoming broader and separated below. Moustache of many weak white bristles continued up the face as whitish hairs. *Palpi* large, red, with many black bristly hairs. *Antennæ* red, the first two joints with black hairs; the third about twice as long as the first two together, with a distinct style. *Forehead* black, shining, with numerous long white hairs. *Thorax* reddish, black on dorsum, with scanty white pubescence, sides reddish, black anteriorly, with three greyish or yellowish tomentose stripes, one on the prothorax and the others above the second and third pairs of legs. *Scutellum* reddish. *Abdomen* reddish, shining, somewhat darker at base, the third and fourth segments with very narrow pale yellow posterior borders; hairs at sides whitish, and a little pubescence of the same colour on dorsum. Genital organs in male prominent, with long white pubescence; in the female the ovipositor small, ending in a circle of spines. *Legs* the same colour as abdomen, the tibiae at base bright yellow, femora largely black below, bristles black. *Wings* large, hyaline, with deep brown colouring on the fore border, extending from the base to the apex, filling the first broad cell and the base of the second one, reaching across the base of it and of discal and fourth posterior cells, then bordered by the third longitudinal vein till it reaches the fork, where it spreads slightly beyond the posterior vein of fork, leaving the apex of second submarginal cell clear.

This description is chiefly taken from Walker's type and from the specimen identified with *D. limbipennis*, both males, together with a female from Melbourne.

Some of the other specimens vary in the following particulars, but appear to be the same species, none of them varying in the extent of colouring of the wing:—The *face* is black in the centre or reddish. Moustache black. Only the posterior tibiae are yellow at base, or none are yellow, the knees above representing this colour. The yellow segmentations on *abdomen* are absent.

[To be continued.]

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LI. — *A Structure in Adeonella (Laminopora) contorta (Michelin) and some other Bryozoa, together with Remarks on the Adeonidæ.* By ARTHUR WM. WATERS, F.L.S.

[Plates X. & XI.]

SOME specimens of Adeonidæ will be dealt with in papers, almost ready, on collections made by Mr. Cyril Crossland, M.A., F.L.S., at Zanzibar and Cape Verde Islands; but having come upon a most curious structure in several species of the family it seems well to deal provisionally with it, as thereby I may receive help towards clearing up several unexplained points.

Many years ago I saw in *Adeonella polystomella*, Reuss, from Naples, bodies looking like short parasitic worms nearly filling up the zoecium. These slides have been examined at various times and it seemed as if the structure really must be Bryozoan, though satisfactory proof was not seen at the time. However, when I found the same thing in *Adeonella lichenoides*, M.-Edw., from Cape Horn, that seemed to show that it could not be parasitic. While looking upon this as one of the numerous puzzles we have in the Bryozoa, some well-preserved *Adeonella contorta*, Mich., from the Cape Verde Islands showed numbers of these bodies in which much more detail was visible than in the two previous species. Again, in cutting *Adeonella polymorpha*, Busk, from Bass's Straits ('Challenger') for confirmation, only

one of these same bodies was found in the slides prepared. None have been found in sections of *Adeonella platalea*, Busk; in *Adeonellopsis distoma*\*, Busk; in a new *Adeonellopsis* from Zanzibar shortly to be described; nor in *Adeona foliacea*, var. *fascialis*, Kirichenpauer. This is the limit of material as yet available, some of which was in poor condition, and it is much to be wished that sections should be cut of several *Adeonæ* and *Adeonellopsis* besides more *Adeoneller*. For a time it seemed as if this was a character peculiar to Adeonidæ or perhaps only *Adeonella*, but I came upon a forgotten note concerning a similar structure in *Retepora cellulosa*, L., from Naples, and now find it in *Retepora mediterranea*, Smitt, and *R. elongata*, Smitt, from Franz Josef Land. Although found in one specimen of *R. cellulosa* from Naples, other specimens from there and from other localities are without it in the sections cut. Similarly the first specimens cut of *A. contorta*, M., showed nothing of the kind.

These masses frequently nearly fill up a zoecium (Pl. X. figs 1, 6, 9) in which the ordinary testes or ovaria are in many cases well developed, and usually a polypide or bud also occurs at the side or over the body, and the zoecia containing them are frequently close to the zoecia or rather gonocœcia with an embryo. The separate bodies are embedded in what may for convenience be called a matrix, and about twenty seems to be an average number; they are elongate or oval, and round in section (Pl. X. figs. 3, 4, 7, 8). Sometimes a few are more or less separated, and one such body is ciliated all round in a transverse section (Pl. XI. fig. 9). The contents are not always the same, but represent various stages: one stage has large dark cells (in carmine-hæmatoxylin) (Pl. X. figs. 2, 3, 4) of rather varying forms, in one direction often more or less triangular with a large dark nucleus (Pl. X. fig. 2, c); another stage shows these cells with a large nucleolus and a nucleus in the cell (Pl. X. fig. 6) or with nucleus and nucleolus with the cell more irregular, often amœboid in shape, and the body now lined with square cells. Some of these bodies, which remind us of planula, have the cells much more numerous, closer together, and with much smaller nucleus (Pl. XI. fig. 3, b 1). There are other bodies, usually one in each mass (Pl. X. figs. 1 and 2, *t.g.*), filled with a structure composed of small nuclei or

\* This has sometimes been described as *A. coseinopora*, Rss., but as Reuss in his papers described two or three species as *coseinopora* the name had better be dropped, since there must always be uncertainty about it.



cells round hollow spaces, and this stains more than any other part, and this so much resembles parts of testes as seen in some species, that it was examined with this idea, but no confirmation was found. This *Adeonella contorta* material has been in spirit some time and there is contraction from the walls of the zoecia, but this is not the case in sections of *Adeonella polystomella*.

The specimens have not shown the relationship of all the parts, and we want to know more about the earlier stages, though in *Retepora cellulosa*, L., some quite small masses have been seen growing from the lateral wall (Pl. X. fig. 5) and some small masses near the basal wall in *Adeonella contorta*, and further material may supply missing links.

In *A. contorta* I have found some zoecia containing a reticulum upon which there are a number of oval cells\*, looking like enlarged nuclei, which stain deeply (Pl. XI. figs. 1, 2). These cells are sometimes much enlarged and irregular in shape and are often seen to be forming groups, which may ultimately be found surrounded by a wall. Some of the bodies are seen in this reticulum, which reminds us of the reticulum in the ovicells of the Cyclostomata and is really a great development of mesenchym cords.

In some cases there are groups of five or six nearly round cells with a small nucleus (Pl. XI. figs. 7, 8), later on we see them enclosed showing the early definite form of the body.

A polypide or bud is frequently found at the side of the mass (Pl. XI. fig. 6, *b*), and sometimes part of a polypide is enclosed, though in many cases this is only apparently so, the mass surrounding part of the polypide alone being bounded by the mesenchym tissue. These groups of bodies are contained in zoecia in various conditions, for they may occur near to zoecia (gonocœcia) with fully developed embryo (Pl. XI. fig. 5) or to zoecia almost filled with testes (Pl. XI. fig. 4), and occur in the same zoecia as the ovaria or spermatozoa, but most frequently in zoecia with buds in various stages; small masses are found in zoecia with polypides in full activity, but as a general rule where the mass is large the polypide has mostly degenerated.

The order of growth seems to be from the stage represented in Pl. XI. figs. 7, 8, through stages shown in several figures, to Pl. XI. fig. 3, *b* 1, then to Pl. XI.

\* A small light spot or vacuole is seen in these cells, but cannot always be made out with a  $\frac{1}{2}$  immersion; in some of the larger cells there are several spots. No nucleus is visible.

fig. 3, b 2, Pl. X. fig. 2, c: subsequently these large cells disappear, first part of the contents, then the nucleus, and a number of small dark cells float about attached to very fine plasma-threads, which at first looked like tails of spermatozoa, but they are attached to several dark cells and it would appear as if they are plasma-threads with nuclei upon them. These points will have to be worked up with fresh material by younger eyes to whom high power work is less trying.

Beside the interest in the structure and function there is the question of its occurring in several *Adeonella*, in fact in most examined, and it will no doubt be a character of classificatory value.

In *Adeonella* the embryo is very large, often in an enlarged zoecium, called a gonœcium\*; on the other hand, *Retepora* has well-developed ovicells with moderate-sized embryos, and large oral glands, whereas none have as yet been found in the Adeonidæ. Sections have been cut of *Retepora antarctica*, Waters; *R. Couchii*, Hincks; *R. frigida*, W.; *R. hippocrepis*, W.; *R. hirsuta*, Busk; *R. lepralioides*, W.; *R. producta*, B., without any of the bodies being found.

In *A. contorta*, &c., these bodies occur in zoecia in which a large number of the polypides are in full activity, and in which there are many embryos and testes; but I have not found them in zoaria, where almost every zoecium contains a polypide, so that it may be that they only occur where vitality is diminishing and they may remain when nearly all the polypides have died down. As this probably is a character of the Adeonidæ, a consideration of the family is

\* Gonœcium was used by Hincks for a modified zoecium set aside for reproductive functions, and in speaking of the gonœcium of Adeonidæ it has been considered that the cells for the embryo were all larger. This is by no means the case, as I have seen in a considerable number of species, though in perhaps the majority it may be larger. I may mention as examples *Adeona foliacea*, var. *fascialis*, Kirchenpauer, which has the embryo in a large sac near the distal end, and is about half the length of a zoecium and occurs in all parts of the zoarium; *Adeonellopsis distoma*, B., in which, after examination of a considerable number, I have found no zoecia specially larger than the others, but here, again, the embryo is in a large sac at the distal end; *Adeonella contorta*, M., in which the embryo is very large, about the length of a zoecium; *Adeonella poly stomella*, Rss. (as redescribed by Manzoni), has all the zoecia of equal size with the embryo in a thick-walled sac near the distal end of the zoecium and rather less than half the length of a zoecium.

Nor must we imagine that an enlarged zoecium is necessarily only for a large embryo, as there will be a polypide in it, or it may be almost filled with testes; in fact the series of changes in contents may be somewhat similar to those known in the ordinary zoecia.

As previously explained, I shall continue to use ovicell as a general term, and then we can say the ovicell is a "gonœcium," &c. &c.

advisable, for it is a group of great importance now, and was in past times, so that when fully examined it may receive a position higher than that of a family. Some other points will be dealt with in forthcoming papers, and drawings have been made, but as yet material is not available for complete studies.

There are a number of bilaminate species of Bryozoa, most of which are strongly pigmented, either purple-violet or dark brown: there are long pore-tubes from the inside of the zoecium to the surface and similar pores connecting the zoecia; there are triangular \* avicularia on the front of the zoecia, and also frequently vicarious avicularia, both without any transverse bar. These vicarious avicularia often occur on the lateral borders of the zoarium. There are no raised ovicells, and the embryo which is surrounded by a thick-walled sac is usually very large, developing in zoecia which in some species are larger than the others, while in other species there is no difference in size. No oral glands have been found †.

Busk attempted to deal with the group in his 'Challenger' Report, and created the genus *Adeonella*, but it has been seen that his grouping must be largely modified even where retained.

I ‡ showed that in his *Adeonella* there were species in which the pore entered into the zoecial chamber, while in others the pore is above the operculum; also in some the operculum is nearly straight on the proximal border, in others there is a broad curve showing that there is a wide sinus on the aperture. I am now able to add that the species in which the operculum is nearly straight or slightly curved also have in nearly all cases a pore or perforated area entering into the zoecial chamber, and this group has been called *Adeonellopsis* § by MacGillivray, and we may expect it to be

\* I have a specimen from S. Africa which I consider is the *Adeona intermedia*, Kirch-pauer, which has, besides ordinary triangular avicularia, large chambers at the side of the fenestrae directed laterally, and closed by a chitinous cover with an absolutely straight lower edge and semicircular distal end. This is probably an avicularium similar to that of *Schizoporella linearis*. Busk had the same species from Australia and gave it the manuscript name *Adeonella inequalis*. 99. 7. 1. 2756, B. Mus.

† I have found no embryo in specimens of *Beania magellanica*, B., from Naples, but sections of a specimen from Chatham Island contain a very large embryo with a thick-walled sac nearly filling the zoecium.

‡ "Chil. Bry. from Aldinga and the River Murray Cliffs, S. Australia," Quart. Journ. Geol. Soc. vol. xli. p. 282 (1885); "Suppl. Report on the Polyzoa," Rep. Voyage of the 'Challenger,' vol. xxxi. pt. lxxix. pp. 2 & 33 (1889).

§ Levinson in his "Studies on Bryozoa" called this *Lobopora*, but in his large work dropped the genus, as it is superfluous.



generally adopted, even if some limitations have to be made. The group without a zoöcial pore presents more difficulties and my suggestion was that it alone should be called *Adeonella*, and it has even been doubted whether it should remain in the same family.

Mr. Hincks criticised my placing *A. polystomella*, Rss., with the group, but his criticism seems to be based upon a misapprehension: one reason he gives is that it has no avicularia, whereas, although avicularia do not occur to all zoöcia, they are fairly abundant, with either one or two narrow avicularia, without a cross-bar, to each zoöcium.

Gregory \* reviews very fairly the opinions expressed by various workers and naturally lays great stress on the ovicells being gonöcia, and my restricted *Adeonella* falls into his Adeonellidæ; but he unfortunately makes a new genus *Schismoporella* for Reuss's *Lepralia schizogaster*, though Reuss's last † figure shows that what Gregory calls a "trypa" is really a narrow avicularium, so that the species is an ordinary *Schizoporella*.

Levinsen ‡ in his large work accepts my restricted *Adeonella*; his *Adeona* has one or two simple "ascopores" §, and includes the reticulate *Adeona*, namely what has been understood as *Adeona*, together with "*Adeona violacea*," Johnst., as a synonym of *Adeonella insidiosa*, Jull.; but this point I am not prepared to accept at present, for Hincks's *A. violacea* and his var.  $\alpha = insidiosa$ , Jullien, seem distinct species, even if they fall into the same genus. Levinsen puts *Bracebridgia*, MacG., under Adeonidæ. *Adeonellopsis*, according to Levinsen, has one or several ascopores, whereas I should say it has the proximal edge of the operculum straight or nearly so, and has usually a perforate area (or sometimes only a pore) in one or both forms of zoöcia, with the pores usually stellate.

We have on the outskirts of both the *Adeonella* and *Adeonellopsis* difficulties, for in *Adeonella* there is *A. bimunita* †, Hincks, which is deeply pigmented, has the long pore-tubes, long triangular avicularia without a bar, also vicarious avicularia of the Adeonidæ type, and gonöcia rather larger

\* "Brit. Palæogene Bryozoa," Trans. Zool. Soc. Lond. vol. xiii. pt. vi. p. 241 (1893).

† "Fossilen Bryozoen des Oest.-Ung. Miocäns," Denk. math.-naturwiss. d. k. Akad. der Wissensch. vol. xxxiii. p. 161, pl. iii. fig. 10 (1874).

‡ 'Morphological and Systematic Studies on the Cheilostomatous Bryozoa,' p. 282 (1909).

§ Gregory has called a pore perforating the front wall a trypa, and Jullien and Calvet have called the pore of *Adeona* &c. the spiramen, so that ascopore scarcely seems required.

|| This is the *Adeonella crassa*, Busk, MSS.



than the ordinary zoëcia, but the operculum fits into a distinct sinus : following on this is *Adeonella* (*Laminopora*) *contorta*, Mich., a bilaminate erect species branching in various directions, with short contorted bilaminate growths springing at right angles from the main branches. It has similar long narrow avicularia without any bar, long pore-tubes, but no suboral pores, and a very long operculum. This has most of the characters of *Schizoporella* ; but there are large embryos, in a thick sac, within gonœcia not externally larger than other zoëcia, though in sections they appear to be larger. The bodies now described in this paper are fairly abundant and we have seen that they occur in several other *Adeonellæ*.

In *Adeonellopsis* there are three species with the same sized flat branching zoarium, the oral aperture the same size and shape, and a small avicularium on one side just below the aperture : but the first, *A. distoma*, Busk, has an area with stellate perforations, the second, *A. subsulcata*, Smitt, has one round pore, while *A. imperforata*, Busk, has no pore. This is not what we should have expected and creates a difficulty in our classification, indicating that we must be careful not to attach too much generic value to the structure of the front wall.

The embryos of the Adeonidæ have not yet been described, but in my forthcoming papers figures and descriptions of some will be given. The species available have been *Adeona foliacea*, var. *fascialis*, Kirchenpauer ; *Adeonella platatea*, Busk ; *A. lichenoides*, Lamk. ; *A. polymorpha*, Busk ; *A. polystomella*, Hincks ; *A. contorta*, Mich. ; *Adeonellopsis distoma*, Busk ; and a new *Adeonellopsis* from Zanzibar : and all except *Adeona foliacea*, var., *Adeonellopsis distoma*, and *Adeonella polystomella*, Rss., have a large embryo in a thick-walled sac, frequently filling up nearly the whole zoëcium. The embryo of *Adeonella polystomella* is in a thick-walled sac, but it is smaller than the others. In *Lepralia cucullata* \*, Busk, which has an internal embryo, the sac is thin-walled like the tentacular sheath ; and in *Lepralia* † and *Schizoporella* there are many cases in which

\* Waters, "Mar. Biol. of Sudanese Red Sea," Bryozoa, Journ. Linn. Soc., Zool. vol. xxxi. p. 150, pl. xv. fig. 4 (1909).

† Among others the following have the ovicelligerous zoëcia larger than other zoëcia :—

<i>Lepralia depressa</i> , Busk.	<i>Monoporella waipukerensis</i> , Waters.
<i>Lepralia bistata</i> , Waters, fossil from New Zealand.	<i>Hipporina</i> , Neviani.
<i>Lepralia cincta</i> , Hincks, but with an ovicell.	<i>Hippothoa</i> .
<i>Schizoporella subimmersa</i> , MacG.	<i>Caleschara</i> .
	Many Catenicellidæ.

the ovicelligerous zoœcia have a different shaped aperture, larger than that of the ordinary zoœcia, but more work is required on the internal anatomy of these. The limits of the group Adeonidæ will have to be based partly upon the form of the embryo.

The bodies described in this paper occur in *Adeonella lichenoides*, *A. polystomella*, B., *A. polymorpha*, B., *A. contorta*, Mich.; but none were found in specimens of *A. platatea*, B., *Adeonellopsis distoma*, B., in the new *Adeonellopsis* referred to, or in *Adeona foliacea*, var. *fascialis*, Kirch.: that is, we have it in several *Adeonellæ*, but not as yet in *Adeonellopsis*.

Now with regard to the characters of the Adeonidæ, the pigment is common to *Holoporella*, and we must emphasize the fact that it is not the pigmentation of an external membrane, but of the contents of the pore-tubes and pigment-cells over the surface; the long tubular pores occur in *Myriozoum*, *Haswellia*, &c. The long narrow avicularium without any bar is a character of considerable importance; but we also find avicularia without any bar in some *Membranipora*, &c., and the projecting process to which Busk refers is well marked throughout the group, but as it occurs in *Cribilina*, *Micro-porella*, a large number of *Membranipora*, and other genera, this character may be dismissed as of very secondary importance. And with regard to the occlusor muscle being single, as stated by Busk, this is the rule with triangular mandibles, whereas the semicircular ones have two bands, so this is a useless character; but although none of the characters given by Busk can stand as he stated them, yet apparently he was right in appreciating that there was the group Adeonidæ.

All the ovaria of Adeonidæ seen, excepting *Adeona foliacea*, var. *fascialis*, consist of two ovarian cells or occasionally three, and with the exception mentioned, no large ovarian cell has been met with. The ovaria originate near the distal end, although close to the proximal end of large embryos one or even three small ovarian cells sometimes occur. In *A. foliacea*, var. *fascialis*, K., the ovaria at first consist of two rather small ovarian cells, but later on one may attain a moderate size.

In the Bryozoa there are sometimes ovaria with only two, or perhaps three, small ovarian cells, neither of which grows to any large size, but passes into the ovicell quite small. In opposition to this there are ovaria with many ovarian cells, one or more of which often attain to a considerable size.

The first I would call the bicellular and the second the multicellular ovaria, though, as the multicellular forms may pass through a stage somewhat like the bicellular, it must be presumed that sufficient material is available before stating to which group ovaria belong. In *Bugula* the ovarium is bicellular and is formed at the proximal end near to the cæcum, passing into the ovicell when quite small. In *Scrupocellaria* the ovarium is multicellular and near the distal end, with some of the ovarian cells very large. Some forms, recently removed from *Bugula* by Levinsen, have the multicellular form, showing by this that they are not so closely allied to *Bugula* as was previously supposed. There are other genera in which the study of the ovaria is going to give us some classificatory assistance.

The Adeonidæ in its fullest sense is a most important group in the Tertiary and Cretaceous periods, as I have seen in the examination of my Cretaceous collections, and a study of Hagenow's and other plates suggests that a large number belong to this group, though in but few is there any difference in the size of the gonœcia and other zoœcia.

There are gonœcia in the fossil *Poricella*\*, Canu; in *Smittistoma*, Canu, *Schizostoma*, Canu, *Calvetina*, Canu; also in the family Meniscoporidæ, including *Poristoma*, Canu, *Meniscopora*, Gregory: but although an external difference in size of the ordinary and gonœcial zoœcia has been seen in some species of Adeonellidæ and its allies, both recent and fossil, it must be repeated that in very many no difference can be found, and this is the case in many Chalk fossils which will probably be found to belong to the group†.

It is a noticeable fact that as we go back in the geological record the number of genera with external ovicells becomes much less numerous. In the Tertiaries the Adeonellidæ and Meniscoporidæ with gonœcia were largely represented, as were also the Onychocellidæ, which have an internal sac for the development of the embryo, also their ally *Cellaria* has no raised ovicell. In the Cretaceous the number with external ovicells is still more reduced. The older workers were not as keenly on the lookout for ovicells as a useful classificatory character as we are, but that is by no means the chief reason why so few have been described fossil.

\* "Bryozoaires des terrains tert. des env. de Paris," Ann. de Paléont. vol. ii. p. 46 (1907); and Étude des Bry. Tert. . . . de la Tunisie, p. 28 (1904).

† The common Tertiary "*Eschara*" *monilifera* has gonœcia.

*Adeonella (Laminopora) contorta* (Michelin).

*Laminopora contorta*, Michelin, Magasin de Zoologie, 1842, pl. iii.

I saw several specimens marked *Laminopora contorta* in the Museum d'Hist. Nat. in Paris and found that it had been described by Michelin. I have since seen it in several museums, from the North Atlantic, mostly from the Cape Verde Islands. However, there are two specimens in the British Museum marked the Red Sea. One of these is known to have been bought at a sale, or in some such way, but the other is marked "Mrs. Robinson bequest," so that we must conclude it occurs in the Red Sea, but it did not come before me when I was at work upon the Red Sea fauna. There is also in the British Museum a specimen from Cape St. Vincent, Spain, 54. 11. 15. 334-336, and some specimens from "John Adams Bank," which, according to Harmer\*, is near the Abrolhos Island, Brazil. There is another Abrolhos Island off W. Australia. These specimens had the manuscript names *Eschara* and *Adeonella dolichostoma*, Busk.

Calvet records it from the Cape Verde Islands† and in the same work describes *Gemellipora arbuscula*, Calvet, from the same locality‡. This has not the numerous short branches at right angles to the main branch, but it is like *A. contorta* and may be a colony before subsequent lateral growth had formed. Both have large lateral avicularia along the border of the zoarium, with broad triangular mandibles directed distally.

The specimens from which I cut sections were collected by Crossland from Boa Vista, Cape Verde Islands, and will be described with his collection from Cape Verde Islands. As the opercula are very thick and there is some gritty matter enclosed during growth it has been difficult to get good serial sections.

In a branch it often happens that the opposite zoœcia are of the same kind—that is, zoœcia containing an embryo are often opposite, as are zoœcia nearly filled with testes, and also zoœcia with the bodies described are often opposite. Should it be found advisable to separate *A. contorta* from *Adeonella* then *Laminopora* may stand.

In *A. contorta* and some fossil Adeonidæ there is a tubule over the operculum in some of the older zoœcia; but although

\* "Revision of the Genus *Steganoporella*," Quart. Journ. Micr. Sci. vol. 43, n. s. p. 254 (1900).

† Expéd. Sc. du 'Travailleur' et du 'Talisman,' p. 420 (1907).

‡ Loc. cit. p. 426, pl. xxvii. figs. 16-19.



this reminds us of the tubule on the closure of many Cyclostomata it is very different, as it occurs over the operculum, and in sections where there has been a second layer of zoecia this is seen like an inverted funnel attached to the tissues of the zoecium below the operculum.

As Michelin's description is in a periodical not readily obtained it is now repeated: "*Laminopora fixa, ramosa, subcompressa, ramulis lamellosis, brevibus divaricatis, contortis, ratis coalitis; extremitatibus undulatis, porosissimis; poris utraque superficie, terminalibus, subrotundis, saepe obstructis; fuscante.*"

## EXPLANATION OF THE PLATES.

### PLATE X.

- Fig. 1.* *Adeonella contorta*, Mich.  $\times 150$ . Section of a zoecium nearly filled with the described bodies in a plasma mass, surrounded by mesenchym tissue. The left-hand body (*t.g.*) near to the opercular aperture stains much more than any others. The various bodies vary considerably in structure, and this mass may be taken as quite characteristic, a large number of practically similar ones having been seen.
- Fig. 2.* Ditto.  $\times 720$ . Part of the above more magnified, showing the left-hand tube-like body partly filled with a deeply staining growth (*t.g.*).
- Figs. 3, 4.* Ditto.  $\times 720$ . Transverse sections of bodies.
- Fig. 5.* *Retepora cellulosa*, L.  $\times 250$ . A small mass growing on the lateral wall of the zoecium.
- Fig. 6.* *Adeonella contorta*, M.  $\times 250$ . Section of a zoecium showing a mass with several bodies and a part of a bud (*b*) by the side, but not enclosed in the mass; pore-tubes (*p.*) full of dark cells; outer membrane (*o.m.*) of the zoarium; operculum (*op.*); walls of the zoecium (*w.z.*). This specimen is somewhat difficult to understand, as it has the appearance of being reversed.
- Fig. 7.* Ditto.  $\times 720$ . Transverse section of body.
- Fig. 8.* Ditto.  $\times 720$ . Longitudinal section of body.
- Fig. 9.* Ditto.  $\times 250$ . Transverse section showing mass with several bodies, and here the histolysing remains of the tentacles of a polypide are enclosed in the mass.
- Fig. 10.* Ditto.  $\times 25$ . Transverse section showing several masses in zoecia, and other zoecia in which the tentacles, stomach, &c. are seen in vigour. Zoecia *a, c, d, f, m* show sections of the polypide; *b, g, j, k, l* show masses of the bodies described; *h, i* show the opercular muscles; *e* is empty.

### PLATE XI.

- Fig. 1.* *Adeonella contorta*, Mich.  $\times 320$ . Zoecium containing mass with dark cells of varying sizes on a reticulum formed of anastomosing plasma. Two of the bodies described are seen

in this mass and outside it part of a polypide. The tentacles (*t.*) are cut through diagonally and the stomach (*st.*) has cilia and evidently the polypide was in vigour.

*Fig.* 2. Ditto.  $\times 720$ . Part of the same mass more magnified.

*Fig.* 3. Ditto.  $\times 250$ . Mass showing one body with numerous cells close together and with a small nucleus (*b* 1) and another (*b* 2) in which they are much larger, further apart, and with a much larger nucleus. This and other parts figured were examined with a  $\frac{1}{12}$  immersion and reduced.

*Fig.* 4. Ditto.  $\times 25$ . Section of the end of a branch in which there are two zoecia (*c, d*) almost filled up with testes, and zoecia (*a, e, g*) with several of the bodies described.

*Fig.* 5. Ditto.  $\times 25$ . Section of the end of a branch in which there is one embryo (*c*) and several of the bodies (*a, e, h, i*).

*Fig.* 6. Ditto.  $\times 85$ . Mass with the early stage represented by two groups of cells near the middle, and also other small bodies.

*Figs.* 7, 8. Ditto.  $\times 720$ . The early groups of cells more magnified.

*Fig.* 9. Ditto.  $\times 720$ . Body with cilia.

*Fig.* 10. Ditto.  $\times 85$ . Mass in zoecium with some of the bodies separated as an independent group. Muscles of the zoecium shown at the side.

*Fig.* 11. Ditto.  $\times 250$ . Testis nearly filling up a zoecium (see *fig.* 4).

LII.—*Descriptions of some apparently new Butterflies from Borneo and one from Africa.* By HAMILTON H. DRUCE, F.L.S. &c.

**Lycænidæ.**

*Lycænopsis shelfordii*, de Nicéy.

*Lycænopsis shelfordii*, de Nicéy. J. B. N. H. S. xiv. p. 245, pl. FF, fig. 7, ♂ (1902).

♀. Upperside: fore wing white, with the costa, apex, and termen broadly smoky brown, the basal and discal area suffused with pale opalescent pearly blue. A small brown spot closing the cell. Hind wing pale smoky brown, with the discal area whitish and the base slightly suffused with opalescent blue: an indistinct submarginal row of lunules. Underside as male, but ground-colour paler and spots rather larger.

*Hab.* Borneo. Batu Lawi Expedition (*J. C. Moulton*).

The female described above, together with a male captured on the same expedition whose genitalia Dr. Chapman has kindly examined and confirmed as *L. shelfordii*, will be placed in the British Museum. The male was taken on May 20th, the female on May 21st.

## Hesperiidæ.

*Pedestes bononoides*, sp. n.

♂. Upperside uniform dull brown, shading to bronze-brown towards base of fore wing, which bears a discal series of eight semihyaline yellowish-white spots, varying in size, the largest being in cell 2, the two spots placed towards the end of the discoidal cell being about equal to the two sub-apical spots; cilia of both wings inclining to ochreous. Hind wing without markings. Underside dull reddish brown, fore wing with the spots as above and the dorsum rather broadly greyish brown. Hind wing with several basal and a discal semicircular row of very indistinct spots darker than the ground-colour. Antennæ black; club ochreous below, with a black tip. Palpi ochreous, sprinkled with dark brown hairs. Abdomen brown above, pale ochreous below.

♀. Similar to male, but larger, and in the specimens before me the semicircular row of spots on the hind wings below is more clearly defined.

Expanse, ♂ 33, ♀ 35 mm.

*Hab.* Matang Road, Sarawak, British N. Borneo (*Moulton*); taken in March and July. Types Mus. Druce.

Arrangement of spots on fore wing much as in *Isma idyalis*, de Nicév. J. A. S. B. vol. lxvi. p. 572, pl. iv. fig. 26 (1897), but the upper spot in the cell is placed beyond the lower, and there are no spots on the hind wings. There are no secondary sexual characters.

*Scobura matanga*, sp. n.

♂. Allied to *S. inarime*, de Nicév.\*, with the semi-transparent spots clear yellow instead of white, the spot on the fore wing between veins 2 and 3 being much more elongate and without the dots in the cell of the hind wing above and in cell 7 of the hind wing below. On the underside the hind wing, instead of being golden yellow, is a dark russet-brown, which colour is also spread over the costa and termen of the fore wing. Abdomen brown, the base of each segment paler below. Palpi ochreous, interspersed with brown hairs. Antennæ black above, yellow-spotted below; underside of club ochreous, excepting the tip, which is black. Fore legs brown, distinctly ochreous below, with brown hairs. Cilia on both surfaces brown, slightly ochreous towards anal angle of hind wing above.

Expanse 37 mm.

\* *Isma inarime*, de Nicév. J. B. N. H. S. 1891, p. 391, pl. G, fig. 38, ♂.

*Hab.* Matang Road, Sarawak, British N. Borneo (*Moulton*).  
Type Mus. Druce.

Also allied to *S. bononia*, Hew., but that insect, again, is golden yellow on the underside and the clubs of the antennæ are ochreous on both surfaces. We have a specimen of *S. bononia* from Borneo agreeing exactly with Hewitson's type. Mr. James Edwards has kindly examined the specimen described above, and states that he does not know it.

#### MATAPOIDES, gen. nov.

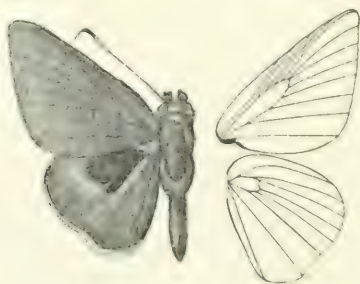
Antennæ: shaft rather long, terminal crook sickle-shaped. Palpi: second joint thickly scaled, third joint concealed. Fore wing: apex produced, termen nearly straight, dorsum markedly convex, with its basal two-fifths distinctly concave; cell narrow, half length of costa. Hind wing: apex rounded, anal angle somewhat produced; vein 5 obsolete, cell very small, costal half bearing a large patch of long hairs which are attached to the membrane in cell 7. Legs spinous, hind tibiæ with two pairs of spurs. No linear sex-mark on fore wing.

Type, *Matapoides smaragdinus*, sp. n.

Differs from *Matapa*, Moore, by the longer and sickle-shaped antennæ, by the shape of the wings, and by the much shorter discoidal cells of both fore and hind wings.

#### *Matapoides smaragdinus*, sp. n.

♂. Upperside: fore wing uniform dark brown, paler towards the apex; below the base of vein 2 is a narrow



brilliant iridescent emerald-green streak, which is only visible when the insect is held at an angle; cilia concolorous with wing. Hind wing dark brown, with the costal half shining



grey, bearing a large tuft of long black hairs attached below vein 8. Cilia from the anal angle to the apex rich orange, above vein 6 gradually becoming brown. Thorax and abdomen thickly clothed with shining emerald-green hairs, visible only in some lights, as is also an emerald-green streak on the hind wing near the dorsum.

Underside: both wings rich dark brown; fore wing with the dorsum from the margin to vein 3 shining greyish brown. Cilia of both wings as on upper surface. Antennæ brown, club whitish above, brown below, tips brown. Head, palpi, and legs brown; anus yellow.

Expanse 55 mm.

*Hab.* Mt. Marapok, Dent Province, British North Borneo. Type Mus. Druce.

Quite unlike any other Hesperid known to me.

*Sepa indistincta*, sp. n.

♂. Upperside: uniform dark brown; fore wing with a discal series of four pale yellowish hyaline spots placed as follows:—a minute dot in the centre of cell 1, a quadrate spot narrowing towards its upper end between veins 2 and 3, a circular spot above and adjoining vein 3, and a minute dot at the lower extremity of the cell. There are two subapical dots placed one above the other, the lower one being slightly larger. A linear sex-mark between veins 1 and 2, inside and bordering the hyaline spot, and continuing for a short distance into cell 1. Hind wing without markings. Cilia of both wings very slightly paler. Underside duller brown; fore wing with the dorsum paler, subapical and discal spots as above, but the spot on cell 1 is much larger and has its edges indistinctly defined. Hind wing with two minute whitish dots towards the centre of the disc. Antennæ black; club, excepting extreme tip, ochreous beneath. Palpi ochreous, thickly interspersed with dark brown hairs. Thorax, abdomen, and legs concolorous with wings.

Expanse 40 mm.

*Hab.* Matang Road, Sarawak, British N. Borneo (*Moulton*). Type Mus. Druce.

Closely allied to *S. (Parnara) miosticta*, de Nicév. J. B. N. H. S. 1891, p. 385, pl. G, fig. 31, ♂, but has a spot in cell 3 and but one in the discoidal cell. The sex-mark, which was not noted by de Nicéville, but is described by Messrs. Elwes and Edwards, is confined to cell 2 in *S. miosticta*, and in *S. indistincta* extends to cell 1.

*Parnara perobscura*, sp. n.

♂. Upperside uniform rich dark brown, slightly greenish towards the base in both wings. Fore wing with a minute semihyaline white dot in the cell placed beyond the middle and close to its upper wall. Usually two, sometimes one or three, minute subapical white dots. A semihyaline white dot at the base of cell 3, and a larger more or less crescent-shaped spot inwardly below it in cell 2. In cell 1 near the middle resting on vein 1 is a minute bright yellow spot. On the hind wing near the centre of the disc are one or two minute whitish dots, which may be entirely obsolete. On the underside the ground-colour is dark brown, with the whole surface of both wings except the dorsum of the fore wing thickly sprinkled with dark ochreous scales. The spots on both wings appear as on the upper surface. Cilia fuscous, paler towards the tornus on both surfaces. Palpi pale ochreous, with some brown hairs. Antennæ pale below, black above. Abdomen brown above, pale ochreous below.

♀. Like the male, but paler, usually with an additional subapical dot placed close to the costa on the fore wing, and with the minute dots on the hind wing more clearly defined.

Expanse, ♂ 30-34, ♀ 31-32 mm.

Type, ♂, Mus. Druce; co-types, ♂ ♀, Mus. Hope.

*Hab.* Addah, West Africa (*Burt*, Mus. Druce); ♂ ♀, N.E. of Entebbe, about 4000 feet (*C. A. Wiggins*, Mus. Hope).

We have long possessed the male specimen from Addah, and on receipt of other specimens by Professor Poulton I have ventured to name this obscure insect. It belongs to the group containing *P. ochracea*, Holland, and *P. micans*, Holland, the former of which it much resembles on the underside, excepting that the semihyaline spots on the fore wing are very different, being much smaller. *P. micans* is a totally different colour, described by Dr. Holland as "Mars brown." We have specimens of both these species, the males of each being without the bright yellow dot in cell 1 of the fore wing. *P. perobscura* is also much like *P. auritinctus*, Butl., but the apex of the fore wing in that species is much more produced and the termen is straight; the ground-colour is paler and the hind wing especially is more golden yellow.

LIII.—*Descriptions of new Cichlid Fishes from South America in the British Museum.* By C. TATE REGAN, M.A.

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*Nannacara tænia*, sp. n.

Depth of body  $2\frac{1}{3}$  in the length, length of head  $3\frac{1}{4}$ . Snout shorter than eye, the diameter of which is  $3\frac{2}{3}$  in the length of head and equal to the interorbital width. Depth of præorbital  $\frac{1}{3}$  the diameter of eye. Maxillary not extending to below eye; jaws equal anteriorly; fold of lower lip continuous; 2 series of scales on cheek, 1 series on præoperculum; 5 short gill-rakers on lower part of anterior arch. Scales  $24\frac{2}{3}$ ;  $\frac{1}{2}$  a scale between upper lateral line and dorsal fin for most of its length. Dorsal XVI 7; last spine  $\frac{1}{3}$  the length of head; soft fin extending to anterior part of caudal. Anal III 7. Pectoral not quite so long as head; ventrals extending to vent. Caudal rounded. Caudal peduncle  $\frac{2}{3}$  as long as deep. A dark oblique stripe from eye to interoperculum; a broad dark longitudinal stripe from eye to base of caudal; narrower stripes at edges of series of scales on body; an oblique stripe from eye to interoperculum; vertical fins dusky.

A specimen of 42 mm. from the Amazon at Manaos, presented by Herr J. Paul Arnold. Two much smaller specimens (30 mm.) are similar to the type, but are not included in the description.

The only other species of this genus is *Nannacara anomala*, Regan, from the Essequibo; the types are 55 to 57 mm. in total length, but the eye is larger and the interorbital space narrower (respectively  $3\frac{1}{2}$  and  $4\frac{1}{2}$  in the length of head), the dorsal spines are higher (last more than  $\frac{2}{3}$  the length of head), and there are differences in form and coloration also.

*Geophagus pellegrini*, sp. n.

Depth of body  $2\frac{1}{3}$  to  $2\frac{2}{3}$  in the length, length of head  $2\frac{2}{3}$  to  $2\frac{3}{4}$ . Snout  $2\frac{1}{3}$  to 3 in the length of head, diameter of eye 3 to  $4\frac{1}{2}$ , interorbital width 4 to  $4\frac{1}{2}$ , depth of præorbital  $2\frac{2}{3}$  to  $3\frac{2}{3}$ . Maxillary not reaching eye; jaws equal anteriorly; lower lip with a deep lobe on each side; cheek with 6 series of scales; 14 gill-rakers on lower part of anterior arch. Scales  $31\frac{4-5}{10}$ ,  $1\frac{1}{2}$  or 2 between lateral line

and anterior rays of soft dorsal. Dorsal XVII 10; last spine  $\frac{1}{3}$  or a little more than  $\frac{1}{3}$  the length of head. Anal III 7-8. Dorsal and anal scaleless. Pectoral a little shorter than head, extending to above the anal spines. Caudal truncate or slightly emarginate. Caudal peduncle longer than deep. A blackish blotch on and below the fourteenth to sixteenth scales of the lateral line; traces of dark cross-bars and of a lateral band; a dark spot at base of caudal; vertical fins dusky.

Three specimens, 75 to 150 mm. in total length, from Tado, Rio San Juan, Choco, S.W. Colombia, collected by Mr. G. Palmer. Three smaller examples (45 to 60 mm.) are not included in the description; they have the same number of scales and fin-rays as the types.

This species is related to *G. camopiensis*, Pellegrin, from Guiana, which has XV-XVI 11-12 dorsal rays, and differs also in the deeper præorbital and more anterior position of the lateral blotch. I have much pleasure in naming this species after Dr. Pellegrin, who has kindly sent me one of the types of *G. camopiensis* for comparison.

*Geophagus hondæ*, sp. n.

Depth of body  $2\frac{2}{3}$  to  $2\frac{3}{5}$  in the length, length of head 3. Snout  $2\frac{1}{2}$  in the length of head, diameter of eye 4, interorbital width 4 to  $4\frac{1}{3}$ , depth of præorbital 3 to  $3\frac{1}{3}$ . Maxillary not reaching eye; jaws equal anteriorly; fold of lower lip continuous or not; cheek with 5 or 6 series of scales; 12 or 13 gill-rakers on lower part of anterior arch. Scales 28-29  $\frac{4-11}{2-10}$ ,  $1\frac{1}{2}$  between lateral line and anterior rays of soft dorsal. Dorsal XVI 9-10; spines subequal from the fifth; last  $\frac{1}{3}$  the length of head. Anal III 7-8. Dorsal and anal scaleless. Pectoral shorter than head, extending to above vent. Caudal slightly emarginate. Caudal peduncle nearly as long as deep. Body with faint bars bearing a series of blotches along middle of side; soft vertical fins spotted.

Two specimens, 80 to 85 mm. in total length, from Honda, Colombia, presented in 1909 by Sir Bryan Leighton.

This species is closely related to *G. crassilabris*, Steind., from Panama, but differs in the smaller head and fewer scales. Dr. Pellegrin has very kindly informed me that the specimens of *G. crassilabris* in the Paris Museum resemble Steindachner's type in having  $2\frac{1}{2}$  series of scales between the lateral line and the anterior ray of the soft dorsal.



*Cichlosoma (Parapetenia) atromaculatum*, sp. n.

Depth of body  $2\frac{1}{4}$  to  $2\frac{3}{4}$  in the length, length of head  $2\frac{1}{2}$  to 3. Snout as long as or longer than eye, the diameter of which is  $3\frac{1}{4}$  to  $3\frac{1}{2}$  in the length of head; interorbital width  $3\frac{1}{4}$  to  $3\frac{3}{4}$ . Depth of preorbital  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of eye. Maxillary extending to below anterior margin, premaxillary processes to above anterior  $\frac{1}{4}$  of eye; jaws equal anteriorly; fold of the lower lip continuous; a pair of anterior canines in the upper jaw, 2 pairs in the lower; cheek with 5 series of scales; 7 or 8 gill-rakers on lower part of anterior arch; lower pharyngeals united by their straight inner edges; pharyngeal teeth conical. Scales 29-31  $\frac{4-11}{10-11}$ , 2 or  $2\frac{1}{2}$  between lateral line and base of anterior part of soft dorsal. Dorsal XVII 10-11; spines subequal from sixth or seventh to fourteenth or fifteenth, which are a little less than  $\frac{1}{3}$  the length of head; last about  $\frac{2}{3}$  the length of head. Anal VI 8-9. Pectoral  $\frac{3}{4}$  the length of head, extending to above vent or origin of anal; ventrals reaching anal. Caudal rounded. Caudal peduncle somewhat deeper than long. Body with 7 dark cross-bars bearing one series of blackish spots above the lateral line and two below it; fourth bar ending above in a spot at base of last three dorsal spines; sixth connecting a pair of spots at ends of bases of dorsal and anal fins; a spot at base of pectoral, another on upper part of base of caudal; fins dusky, with traces of series of small darker spots.

Four specimens, 85-115 mm. in total length, from Tado, Rio San Juan, Choco, S.W. Colombia, collected by Mr. G. Palmer.

This species is related to *C. urophthalmus*.

LIV.—*Note on the Cyclogasteridæ.*

By CHARLES VICTOR BURKE.

LÜTKEN (1898) has called attention to the uncertainty existing concerning the species of *Cyclogaster* and *Careproctus* and the validity of the latter genus. From an examination of the work of other writers, notably that of Collett (1880 and 1905) and Smitt (1893), we are forced to agree with Lütken that there is a "hopeless *Liparis* question," especially as regards the species of the North Atlantic and the Arctic Ocean north of Europe. This confusion has

resulted from the lack of an appreciation of the specific characters and amount of specific variation. For instance, we find that *Cyclogaster liparis* is described as having D. 32-49; A. 26-38; P. 34-42. This amount of fin-ray variation certainly does not exist. It is doubtful if the number of fin-rays in any of the species of *Cyclogaster* varies more than six. It is probable that in *Careproctus* and *Paraliparis* the number of fin-rays varies more than in *Cyclogaster*.

During the preparation of a monograph of the Cyclogasteridæ I have had occasion to attempt to untangle the chaotic condition of the literature dealing with the species represented in the museums of Europe. This has been found to be an impossible task without an examination of the material. Such an attempt can lead only to greater confusion. The examination by a competent ichthyologist of all the specimens of this family in the museums of Europe would doubtless be very fruitful of results. I have found eight undescribed species and a very aberrant genus in the principal museums of the United States. The European collections also doubtless contain undescribed species. From the study of a large amount of material in the United States it is possible to present a few notes which may aid any one working with the specimens in the museums of Europe. It is with this hope that the present paper is published.

A number of European writers have refused to recognize the genus *Careproctus*, and have listed the species belonging to this genus with those of *Cyclogaster*. The species of *Careproctus* can be readily distinguished from those of *Cyclogaster* by the absence of the posterior nostril. So far as known, the two genera differ mainly in this single character. Smitt (1893, p. 284) describes the adults of *Cyclogaster montagui* as lacking the posterior nostril, but this doubtless is an error. *Cyclogaster* is the only described genus in which both nostrils are present. In addition to the loss of the posterior nostril, the species of *Careproctus* have obtained a distinct coloration from those of *Cyclogaster*. The coloration may be considered a supplementary means by which we can separate the species of the two genera. It probably will be found to be of less importance than the difference in the nostrils. The species of *Careproctus* are never variegated, as is typical of the species of *Cyclogaster*. They lack the mottlings, bars, stripes, and blotches nearly always present on the body or fins of the species of the latter genus. The coloration of the species of *Careproctus* varies from whitish to pinkish, dusky, and black.

The species of *Cyclogaster* from the North Atlantic and

Arctic Ocean can be identified by the following key. All of these species have not been carefully studied by the writer, because of the lack of material, but they appear to be well defined and easily recognized when we become familiar with the specific characters and the amount of variation. In this key the many described varieties of *Cyclogaster liparis* are not recognized. It is possible that more than one species is grouped under this name. This species is one not thoroughly studied by the writer because of the want of material. It is likely that one or more species not recognized here will be found represented in the museums.

- A. Peritoneum silvery or white, with few or no black dots.
  - B. Anal fin with less than 30 rays; dorsal fin usually notched.
    - C. Pectoral fin with less than 30 rays.
      - D. Anterior dorsal sometimes elongate; prickles sometimes present; dorsal rays more than 30. (American.) ..... *atlanticus*.
      - DD. Anterior dorsal rays never elongate; prickles never present; dorsal 30 or less. (European.).. *montagui*.
    - CC. Pectoral fin with more than 30 rays; pyloric cæca less than 20 ..... *liparis*.
  - BB. Anal fin with more than 30 rays (34-37); dorsal fin never notched; rays 41-44 ..... *tunicatus*.
- AA. Peritoneum usually black, sometimes heavily pigmented with black; dorsal fin with 48 rays; anal 40; pectoral 34 ..... *major*.

The species of *Careproctus* are not so easily distinguished as the species of *Cyclogaster*. This is because the specific characters of the species of the former genus are more difficult to examine and we have a smaller amount of material to work with. We find three species (not counting *gelatinosus*, Pallas) of *Careproctus* recorded from the North Atlantic and Arctic Ocean. The validity of all of these species has been questioned. These species are *C. reinhardi* (Kröyer), 1862; *C. ranula* (Goode & Bean), 1879; and *C. micropus* (Günther), 1898. A number of writers have regarded *C. reinhardi* as identical with *C. gelatinosus*\*. Garman (1892) refers *C. ranula* to the synonymy of *C. reinhardi*. Lütken

\* The description of *Cyclopterus gelatinosus*, Pallas (1769), is so unsatisfactory that we are not justified in identifying any of our species with that described by Pallas. Furthermore, the species described by Pallas was obtained in the Pacific Ocean, and we are hardly justified in identifying any of the North Atlantic species with it. This is especially true when we consider that, as recent inquiry has shown, none of the species of the family can with certainty be said to exist on both sides of the North American continent.

(1898) indicates his uncertainty concerning the specific individuality of *C. reinhardi* and *C. micropus*. However, he lists a number of specimens as *Liparis micropus*, and figures a specimen of what he considers to be *Liparis reinhardi*. Collett (1905) lists a number of specimens as *Liparis reinhardi*, and presents two figures (pl. ii. figs. 7, 8). The two specimens represented by these figures doubtless belong to different species.

I have examined but one of these three species, *C. ranula*, but after studying the specific characters of the Pacific species of the genus I feel convinced that both Lütken and Collett are mistaken in their identifications. The two specimens figured by Collett (1905, pl. ii. figs. 7, 8) certainly represent two species. The specimen represented by fig. 8 apparently belongs with the species described and figured as *Careproctus reinhardi* by Collett in 1880 (pl. ii. figs. 15, 16). This species appears to be the one described by Krøyer (1862, p. 252) as *Liparis reinhardi*. The specimen figured as no. 7 appears to represent an undescribed species. It differs from *C. reinhardi* in the much longer lower pectoral lobe and the deeper body. The specimen figured by Lütken (1898, pl. iii. figs. 3, 3a) as *Liparis reinhardi* belongs with this species. Lütken's specimen is here designated as the type of a new species, *Careproctus longipinnis*.

*Careproctus longipinnis*, Burke, sp. n.

*Type*. 'Ingolf,' St. 139, north of the Faroe Islands; depth 702 Danish fathoms. Figured by Lütken as *L. reinhardi* in "Danish 'Ingolf' Expedition," vol. ii. pt. i., The Ichthyological Results, pl. iii. figs. 3, 3a.

*Distribution*. Arctic Ocean; Faroe Islands to Beeren Island.

*Relationships*. *C. longipinnis* differs from all the other species of the genus from the same region in the deeper body and the lower lobe of the pectoral being longer than the head. The disk of *C. longipinnis* appears to differ from that of the other species in being more deeply cupped, and the posterior margin is folded over so that the disk becomes somewhat triangular. The vent is next the disk.

*Description of type*. The following notes are taken from Lütken's description and figure:—

Pectoral 31; caudal 10; head 4.9 in the total length; eye 5 in the head; disk 4.6. (Collett's specimen has dorsal 53; anal 44; pectoral 30.)

From the figure:—Body somewhat gelatinous; depth of



body greater than length of head. Head deep and heavy; profile steep. Snout short, not projecting. Nostril single. Gill-slit above the pectoral fin. Caudal connected to the dorsal for nearly half its length. Pectoral notched; the lower lobe of 8 partly free rays, extending back as far as the upper lobe, exceeding the length of the head by a little more than the diameter of the eye. Disk small, somewhat cupped and triangular, the posterior margin folded over. Vent near the disk. Body translucent, pinkish.

*Liparis reinhardi*, Lütken, 1898, Danish 'Ingolf' Expedition, vol. ii. pt. i., The Ichthyological Results, p. 14, pl. iii. figs. 3, 3a (in part, not of Krøyer).

*Liparis reinhardi*, Collett, 1905, Report on Norwegian Fishery and Marine Investigations, vol. ii. 1905, no. 3; "Fiske," under Michael Sars, Togter i Nordhavet, 1900-1902, p. 97, pl. ii. fig. 7 (in part, not of Krøyer).

*Careproctus longipinnis* is the fourth species from the North Atlantic and Arctic Ocean. From the corresponding region of the Pacific Ocean twenty-nine species are known (the majority of these are as yet undescribed). It is possible that this disparity in numbers will be lessened when the Cyclogasteridæ in the Atlantic Ocean become better known.

The following tentative key to the species of *Careproctus* from the North Atlantic and adjacent portions of the Arctic Ocean is presented, not with the expectation that it will prove satisfactory, but that it may stimulate an examination of material and the production of a more satisfactory one:—

- A. Lower lobe of pectoral shorter than the head; depth of body less than length of head; disk round or oval.
  - B. Eye less than 4 in head (?); the pectoral notch hardly evident; dorsal 53; anal 49; pectoral 28 ..... *ranula*.
  - BB. Eye more than 4 in the head (?).
    - C. Pectoral notch deep; dorsal 55; anal 45; pectoral 33..... *reinhardi*.
    - CC. Pectoral notch shallow; dorsal 35 (?); anal 35 (?). *micropus*.
- AA. Lower lobe of pectoral longer than head; depth of body greater than length of head; disk somewhat triangular, cupped, the posterior margin folded over; vent close to disk ..... *longipinnis*.

#### ANTARCTIC SPECIES.

A number of species of *Cyclogaster* and *Careproctus* have been recorded from the Antarctic regions. There has been some uncertainty as to the genera in which these species should be placed. From an examination of the descriptions and figures the writer places these species as follows:—

*Liparis antarctica*, Putnam, = *Cyclogaster antarctica*.

Gill (1891, p. 365) places this species with *Enantioliparis*, Vaillant (1888). Vaillant based this genus upon the continuous vertical fins and the unnotched pectorals. In the writer's opinion neither of these characters is of sufficient value to justify the formation of the genus. The vertical fins of *Enantioliparis pallidus* find their counterpart in *Cyclogaster pulchellus* and other species. The pectoral notch is absent or nearly so in *Cyclogaster owstoni*, *Careproctus furcellus*, and *Careproctus cypselurus*. As will be seen below, I place *pallidus*, Vaillant, with the genus *Careproctus*. Gill's suggestion that the three species, *antarctica*, Putnam, *steineni*, Fischer, and *pallidus*, Vaillant, may be one is very doubtful. The first two species differ widely in the number of fin-rays, and do not appear to be closely related. It seems unlikely that *steineni* and *pallidus* are identical. I place them in different genera. Lönnberg (1905, p. 19) has called attention to the differences between these species.

*Liparis steineni*, Fischer, = *Cyclogaster steineni*.

Fischer describes the nostril of this species as "Hinteres Nasloch in einer weiter ziemlich kurzen Röhre, die ebenso weit vom Auge, wie vom Lippenrande entfernt ist; vorderes ziemlich nahe vor jenem, einer Schleimpore ähnlich." The posterior nostril in these fishes is never in a projecting tube; at least, it is not so in the ninety species I have examined. It seems likely that Fischer described the anterior nostril as the posterior nostril and one of the pores on the snout as the anterior nostril. If there is no pore behind the nostril-tube in this species it belongs with *Careproctus*. The fact that the specimens were collected in very shallow water "in der Royal Bai mit der hand gegriffen" suggests that they are typical *Cyclogaster*, as none of the species of *Careproctus* are known to inhabit such shallow water.

*Enantioliparis pallidus*, Vaillant, = *Careproctus pallidus*.

As stated above, I do not consider the genus *Enantioliparis* worthy of recognition. The figure and coloration of *pallidus*, Vaillant, bear a closer resemblance to the typical species of *Careproctus* than to the species of *Cyclogaster*, and for this reason we place *pallidus*, Vaillant, with the former genus. The disk of this species is large and the teeth trilobed, but these characters are common to a number of species of *Careproctus* as well as typical of *Cyclogaster*.

*Careproctus georgianus*, Lönnerberg, = *Careproctus georgianus*.

The posterior nostril appears to be absent in this species. Undoubtedly the species has been correctly placed by Lönnerberg.

*Liparis antarctica falklandica*, Lönnerberg,  
= *Careproctus falklandica*.

The single nostril and the coloration indicate that this species belongs with *Careproctus*.

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LV.—On Insectivores and Rodents collected by Mr. F. Kingdon Ward in N.W. Yunnan. By OLDFIELD THOMAS.

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AFTER the finish of Mr. Malcolm Anderson's collecting work in Western Sze-chwan for the Duke of Bedford's Expedition, his two companions Dr. J. A. C. Smith and Mr. F. Kingdon

Ward each did some collecting on their own account in different parts of China. The former sent home from Kan-su the new rodents I described in the 'Annals' for last December, while the latter made in the far north-west of Yunnan the present collection, which has been acquired for the British Museum by the kind help of the Duke of Bedford.

Although owing to his other avocations Mr. Ward was not able to send any large series of mammals, the collection contains several novelties, both, as usual in this region, some new voles and also a representative of the remarkable Insectivorous genus *Scaptonyx*, which Mr. Anderson had never obtained, and which is a genus new to the Museum collection.

Altogether Mr. Ward's collection is of great interest, and shows how much more remains to be done in that rich mountainous area of Western China.

With the exception of the type of *Microtus wardi* all the specimens were obtained at or near A-tun-tsi, a place some 200 miles S.W. of Ta-tsien-lu, in the drainage-area of the Upper Me-Kong.

1. *Scaptonyx fusicaudatus affinis*, subsp. n.

♂. 19. 12 miles S.E. of A-tun-tsi. 13,500'. 22nd June, 1911. B.M. no. 12. 3. 18. 1. *Type*.

General characters of *fusicaudatus*, but upper canine larger, premolars smaller— $p^3$  not larger than  $i^2$ ,  $p^1$  and  $p^2$  subequal, smaller than  $p^3$ ,  $p^4$  slightly shorter horizontally than in *fusicaudatus*, but of about the same breadth. Below, the whole tooth-row is shorter, the incisors less spatulate, the canine (the third tooth in the jaw) shorter than the posterior incisor and more slender.  $P_1$  (the large caniniform tooth) and  $p_4$  nearly equal in size, though rather lighter than in *fusicaudatus*, but  $p_2$  and  $p_3$  conspicuously smaller than in that animal;  $p_3$  not a quarter the bulk and about half the height of  $p_4$ ,  $p_2$  again about half its bulk and three-fourths its height, both teeth single-rooted.

As Milne-Edwards supposed, zygomatic arches are present, though very slender.

Dimensions of the type (measured in the flesh):—

Head and body 90 mm.; tail 31; hind foot 15.5; ear 3.5.

Skull: greatest length 24.3; basal length 20.2; greatest breadth 10.7; zygomatic breadth 8.6; intertemporal breadth 5.4; palatal length 11; breadth outside molars 6.8; upper tooth-series 10.5; lower tooth-series 9.2; horizontal length of  $p^3$  0.5,  $p_1$  0.7,  $p_2$  0.3,  $p_3$  0.5,  $p_4$  1.0.



Type as above.

"Caught on mossy bank in *Abies* forest."—F. K. W.

The nose of this specimen is elongate, approximating to that of *Uropsilus*, and there is no doubt the short-nosed condition described and figured by Milne-Edwards was due to the vicissitudes his specimen had undergone.

This is the first example of the distinct genus *Scaptonyx* that has come to the British Museum, David's specimen in the Paris Museum having remained unique up to the present time. Thanks to the courtesy of Prof. Trouessart I have had an opportunity to compare the skulls of the two, and find such differences in the proportions of the premolars as to indicate that the Me-Kong form is subspecifically distinct. All other characters would seem to be the same.

With regard to the dentition of *Scaptonyx*, it is evident that in one respect at least the formula given by Milne-Edwards is erroneous, for while correctly identifying the upper canine, he has not noticed that the long caniniform tooth of the lower jaw bites behind instead of in front of it, and is therefore—as in the true moles—the first premolar.

Putting the formula, therefore, in the same manner as those of the other members of the group recently published\*, we should have:—

$$I. \frac{1.2.3}{0.2.3}, C. \frac{1}{1}, P. \frac{1.2.3.4}{1.2.3.4}, M. \frac{1.2.3}{1.2.3} = \frac{11}{10} \times 2 = 42.$$

The number of teeth is the same as in *Mogera*, there being one less lower incisor than in *Talpa*. Whether the missing incisor is  $i_1$  or  $i_3$  remains to be proved, both for *Scaptonyx* and *Mogera*, but the indications of the milk-dentition seem to show that in *Dymecodon* and *Urotrichus* at least it is  $i_1$ , as formulated above.

So far as its dentition is concerned, *Scaptonyx* is in an interesting halfway condition between the *Talpa* group, in which the canine above and caniniform premolar below are dominant, the incisors being small, and *Urotrichus* and the American moles, in which the main work is thrown on the anterior incisors, both above and below. Here there is apparently little difference in functional importance between the competing teeth.

## 2. *Marmota robusta*, M.-Edw.

♀. 20 (young). A-tun-tsi. 15,000'.

\* P. Z. S. 1912, p. 131.

3. *Epimys confucianus*, M.-Edw.

♀. 3. A-tun-tsi. 11,500'.

4. *Apodemus speciosus latronum*, Thos.

♂. 4, 8, 13, 15, 23; ♀. 12, 14. A-tun-tsi. 12,000'.

5. *Apodemus chevrieri*, M.-Edw.

♀. 24, 27. A-tun-tsi. 12,000'.

6. *Microtus irene*, Thos.

♀. 9, 22. A-tun-tsi, N.W. Yunnan. 14,000-16,000'.

♂. 26. Mo-ting, N.W. Yunnan. 15,000'.

7. *Microtus (Anteliomys) wardi*, sp. n.

♂. 18 (skull only). Chamutong, Upper Salween drainage-area, W. of A-tun-tsi. 13,000'. B.M. no. 12. 3. 18. 15. *Type*.

Skull smaller, flatter, and with much smaller bullæ than in *M. (A.) chinensis*.

Size rather less than in the only previously known species of this subgenus, *M. (A.) chinensis*, Thos. Skull with comparatively small brain-case, its upper outline less convex, its height considerably less, owing both to the smaller bullæ and lower brain-case. Palatal foramina narrow throughout, scarcely broader mesially. Posterior edge of palate as in *chinensis*. Bullæ conspicuously smaller in all dimensions.

Incisors unusually long in the type, their outer corners produced into two long points. Molars essentially as in true *chinensis*:  $m^1$  with spaces 2+3 and 4+5 communicating respectively with each other;  $m^2$  with spaces 2+3 open;  $m^3$  with all the spaces communicating, the outline of the tooth as in typical *chinensis*, its inner side with five well-marked angles.

Dimensions of the type (the flesh-measurements recorded on the skull-label):—

Head and body 119 mm.; tail 57; hind foot 19; ear 14.

Skull: condylo-incisive length 27.3; basilar length 24; zygomatic breadth 15.7; nasals  $8.2 \times 3.4$ ; interorbital breadth 4.2; combined height of brain-case and bullæ 9; diastema 8.5; palatal foramina 8.5; upper molar series (crowns) 6.3.

*Hab. & Type* as above.

This fine vole, which I have named in honour of its discoverer, is readily distinguishable from its only previously described ally *M. (A.) chinensis* by its lower skull and much smaller bullae. Mr. Ward says that it is common at Chamutong, and it was merely by an accident that he only brought home the single skull now described.

In working out this species I have had occasion to study the specimens hitherto referred by me to *M. (A.) chinensis*, 17 in number, 8 from the neighbourhood of Ta-tsien-lu and 9 from Omi-san and Kiating-fu, the latter being the type locality.

The two sets agree closely with each other in all respects except certain details of tooth-pattern, in which there is such an average difference that I think the two should be distinguished subspecifically. The new form may be called

*Microtus (Antelomys) chinensis tarquinius*, subsp. n.

$M^3$  with only four salient angles on its inner side (in 7 out of 8 specimens), *chinensis* having 5 (in 8 out of 9 specimens). Spaces of teeth generally tending to be less frequently open to each other, the two following pairs of spaces being taken as samples: spaces 2+3 of  $m^1$  closed in 5 out of 8 specimens, open in all 9 of *chinensis*; spaces 3+4 of  $m^3$  closed in 6 out of 8, open in 7 out of 9 in *chinensis*. Front part of  $m^3$  less like that of an *Alticola*, the spaces 1+2 narrowly open or closed in 6 out of 7 specimens, broadly open and *Alticola*-like in 8 out of 9 *chinensis*.

Dimensions of the type:—

Head and body 108 mm.; tail 68; hind foot 21; ear 15.

Skull: occipite-nasal length 28.7; condylo-incisive length 27.5; zygomatic breadth 16.1; upper molar series (crowns) 6.2.

*Hab.* (of type). 23 miles S.E. of Ta-tsien-lu, W. Szechwan. Alt. 10,000'.

*Type.* Adult male. B.M. no. 11. 2. 1. 207. Original number 2328. Collected 15th June, 1910, by M. P. Anderson. Presented by the Duke of Bedford.

8. *Microtus (Antelomys) custos*, sp. n.

♂. 2, 6, 7, 11, 21; ♀. 1, 10, 16, 17. A-tun-tsi, N.W. Yunnan. 11,500–12,500'.

A brown vole looking like a *Caryomys*, but with teeth as in *Antelomys*.

General appearance very much as in *M. (Caryomys) nux*.

Fur long and soft; hairs of back about 11 mm. in length. General colour above rather warmer than "broccoli brown"; head more greyish brown. Under surface paler brown, the hairs of the belly washed with wood-brown, but those of the throat, chest, and axillæ with greyish tips. Ears short, brown, little prominent. Hands and feet greyish white above; hind foot-pads 6. Tail short, dark brown above, greyish below. Mammæ 0—2=4.

Skull with the characteristic shape found in the three subgenera, *Eothenomys*, *Antelionomys*, and *Caryomys*, the upper surface smooth, rounded, without marked ridges, the inter-orbital region broad, short, its edges rounded and its middle line flat or concave, without tendency to form a median crest. Palatal foramina somewhat dilated in their anterior third. Bullæ rather small, slightly larger proportionally than in *M. wardi*.

*Teeth*.—First upper molar with spaces 4+5 generally though not always open, the other spaces always closed.  $M^2$  with spaces all closed, a small projecting angle on the inner side of its fourth prism, corresponding to the prominent postero-internal angle formed in certain species of the group.  $M^3$  long, complicated, about as in *M. wardi* and *M. chinensis chinensis*, its front end with an *Alticola*-like double space, spaces 1+2 broadly connected; spaces 3+4 also connected; its inner side with four prominent salient angles and one or even two smaller posterior ones; outer side with 4—5 smaller angles. Lower teeth, as usual, with all the spaces open and opposite,  $m_1$  with 4 outer and 5 inner salient angles.

Dimensions of the type (measured in flesh):—

Head and body 101 mm.; tail 46 \*; hind foot 17; ear 13.

Skull †: greatest length 25; condylo-incisive length 25; zygomatic breadth 14.5; nasals  $7.3 \times 3.4$ ; interorbital breadth 4.4; combined height of brain-case and bullæ 8.5; palatal length 11.6; palatal foramina 5; upper molar series (crowns) 6.1.

*Hab.* as above.

*Type*. Old male. B.M. no. 12. 3. 18. 19. Original number 11. Collected 28th May, 1911.

This interesting species shows a certain approximation towards the subgenus *Caryomys*, but its long complicated  $m^3$  with an *Alticola*-like anterior end, with spaces 1+2 open, and its usually open spaces 4+5 of  $m^1$ , indicate that its proper

\* Range 35–48.

† Larger than most; another adult skull measures 23.6 mm. in condylo-incisive length.



position is in *Anteliumys*, of which it is considerably the smallest species.

There is, however, no doubt that *Eothenomys*, *Anteliumys*, and *Caryomys* are all much more closely allied to each other than has hitherto been recognized, and it is really only by the open or closed state of certain of the tooth-spaces and by the simple or complex condition of  $m^3$  that they can be distinguished from each other.

### 9. *Ochotoma roylei chinensis*, Thos.

♀ (imm.). 25. A-tun-tsi. 16,000'.

A form of *Pika* only recently discovered at Ta-tsien-lu by Capt. F. M. Bailey.

## LVI.—Description of a new Fish from British East Africa. By G. A. BOULENGER, F.R.S.

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### *Tilapia grahami*.

Depth of body 3 to  $3\frac{1}{2}$  times in total length, length of head  $2\frac{1}{2}$  to  $2\frac{2}{3}$  times. Head large,  $1\frac{1}{2}$  to  $1\frac{2}{3}$  times as long as broad; snout rounded, with convex upper profile, much broader than long,  $\frac{3}{4}$  postocular part of head; eye  $3\frac{1}{2}$  to  $4\frac{1}{2}$  times in length of head, a little greater than præorbital depth; mouth large,  $\frac{3}{4}$  width of head, extending to between vertical of nostril and anterior border of eye; lips very strongly developed, the lower forming a very distinct lobe on each side; teeth moderately slender, in 4 series, 30 to 34 in outer series of upper jaw; 3 series of scales on the cheek, width of scaly part nearly equal to diameter of eye. Gill-rakers short, 10 or 11 on lower part of anterior arch. Dorsal XI 11–12; spines feeble, subequal from the third, which measures  $\frac{1}{3}$  length of head. Anal III 8–9; spines feeble, like the dorsals. Pectoral  $\frac{2}{3}$  to  $\frac{2}{3}$  length of head, not reaching origin of anal. Ventral not reaching vent. Caudal rounded. Caudal peduncle as long as deep. Scales cycloid, 28–30  $\frac{3}{11}$ ; lateral lines  $\frac{14-18}{6-11}$ ; breast and belly naked. Dark blue above, with more or less distinct, ill-defined darker bars; sides with pale blue spots; dirty white beneath; lower labial lobe perfectly

white; fins greyish, soft dorsal, anal, and caudal with numerous small darker spots which may form vertical bars on the caudal; the latter with the posterior edge of a faint pink.

Total length 60 mm.

Lake Magadi, a hot soda lake in bottom of Rift Valley, British East Africa, at an elevation of 1980 feet above sea-level. The lake is perfectly isolated, the nearest water being the Southern Enaso Nyiro, a river rising in the Mau plateau and flowing into a natron lake on the boundary of British, German, and East Africa. The fish were caught by Mr. J. W. Graham in warm water (up to 120° Fahr.), and several specimens have been presented by him to the British Museum.

Special interest attaches to this new *Tilapia*, one of the smallest of the genus, from the conditions under which it lives. I am indebted to Mr. Graham for the following notes concerning the habits:—

“The fish were discovered in various isolated springs of soda liquor on the eastern shore of Lake Magadi, a natural soda deposit at the bottom of the ‘Great Rift Valley,’ in latitude 2° south and at an elevation of 1980’ above sea-level. In some cases the thermal springs in which the fish are found run out in the form of a very shallow stream (1” to 6” deep) over the soda-mud flats; in others the springs are quite isolated, forming pools, and can have no connection with adjacent springs except during very exceptional rains, and then for but a short time. The temperature of the various springs varies, but the fish have been found in all temperatures from 80° F. to 120° F. Apart from the occasional intercommunication between the springs mentioned above, there is no connection at any time with other possible breeding-grounds, fresh water or otherwise. In other words, there are no streams entering the lake nor are there any running out of it. The springs are completely landlocked. The fish are very active in their movements and show great alarm on the approach of human beings. They probably mistake them for birds of prey, although at no time during the two years the fish have been under my observation have any birds been noticed to be feeding on them. The principal food of the fish appear to be the green- and pink-coloured algæ surrounding the sources of the various springs, and the fish will climb up a trickle of water to the height of a foot or more above the normal soda-liquor level in order to reach this food. The algæ are so plentiful as to look like slimy moss around the springs. The fish were breeding in December last, the male making a nest in the sand and females

depositing their ova in it in rapid succession. Intrusive males were promptly expelled. Samples of the fish, male and female, were obtained and of the ova in every stage of development.

"The most striking feature of the fish in its natural state is the heavy opaque white under lip. This is not always very evident in the preserved specimens, and the very faint pink coloration on the posterior edge of the tail appears to have entirely vanished."

LVII.—*A Key to the Australasian Species of Ochlerotatus*  
(Culicidæ). By F. W. EDWARDS, B.A., F.E.S.

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A RECENT examination of the Culicidæ described last year by Mr. E. H. Strickland has revealed the fact that many of them were previously known under other names. As all Strickland's types, and, indeed, the types of most of the Culicidæ so far described from Australia, are in the British Museum, the task of composing a table of the species proved a comparatively easy one, and it seems as though it would be of use to publish at once the results of the examination of the material in the National Collection. The following table is of course intended to be used in conjunction with the published descriptions. For a definition of the genus *Ochlerotatus*, with full generic synonymy, vide 'Bulletin of Entomological Research,' vol. iii. no. 1,

*Table of the Species.*

1. Joints of tarsi, especially on the hind legs, pale-ringed at the base .....	2.
Joints of tarsi not pale-ringed .....	16.
2. Thorax, femora, and tibiæ adorned with fine white lines .....	1. <i>notoscriptus</i> ,
Species not so marked .....	3.
3. Deep blue, submetallic scales on abdomen, legs, proboscis, and palpi .....	2. <i>purpureus</i> ,
Not blue species .....	4.
4. Head and sides of mesonotum clothed with short yellowish spindle-shaped scales....	3. <i>aculeatus</i> .
Head in middle and whole of mesonotum clothed with longer, curved, quite narrow scales .....	5.

- |   |                               |
|---|-------------------------------|
| 5. Anterior two-thirds or more of mesonotum clothed with pale golden scales, rest dark; the rings on the tarsi are not very distinct.   | 4. <i>australiensis</i> .     |
| Thorax differently adorned .....  | 6.                            |
| 6. Thoracic scales pale ochreous, with four very distinct dark longitudinal lines; abdomen nearly all pale ochreous .....   | 5. <i>vittiger</i> .          |
| Species not at all resembling the last .....  | 7.                            |
| 7. Integument of wings with a large dark patch towards costa in middle .....  | 6. <i>vandema</i> .           |
| Integument of wings not perceptibly darkened.   | 8.                            |
| 8. Wings conspicuously mottled with light and dark scales .....   | 9.                            |
| Wings not conspicuously mottled .....   | 10.                           |
| 9. Scales and integument of mesonotum deep chocolate-brown: tarsal rings indistinct (on anterior legs: others missing) .....  | 7. <i>stricklandii</i> .      |
| Scales of mesonotum yellowish brown; tarsal rings distinct .....  | 8. <i>flavifrons</i> .        |
| 10. Femora, and often tibiæ and metatarsi, mottled with light and dark scales ....  | 11.                           |
| Legs not mottled .....  | 15.                           |
| 11. Tibiæ mottled; last hind tarsal joint whitish at base .....   | 12.                           |
| Tibiæ not mottled; last hind tarsal joint entirely dark .....   | 14.                           |
| 12. Lateral pale spots of abdominal segments (which form part of the pale band at the base of each segment) spreading out towards the middle line in the middle of the segments ..... | 13.                           |
| Lateral spots of abdomen without median projections .....   | 9. <i>labeculosus</i> .       |
| 13. Thorax nearly black; female palpi white only at the tip .....   | 10. <i>vigilax</i> .          |
| Thorax more reddish; female palpi pale at the tip and near the middle .....   | 11. <i>nocturnus</i> .        |
| 14. Femora with a rather distinct pale ring near the tip; thorax darker .....   | 12. <i>alboannulatus</i> .    |
| Femora without any pale ring; thorax lighter .....  | 13. <i>occidentalis</i> .     |
| 15. Last joint of hind tarsi white only at base ..  | 14. <i>rubrithorax</i> .      |
| Last joint of hind tarsi entirely white ....  | 15. <i>quasirubrithorax</i> . |
| 16. Femora (at least those of the four anterior legs) distinctly mottled .....  | 17.                           |
| Femora not at all mottled .....   | 19.                           |
| 17. Integument of thorax "deep brown or pitchy black" .....   | 16. <i>sagax</i> .            |
| Integument of thorax reddish brown; basal joint of antennæ yellowish, but with a black spot on the inner side .....   | 18.                           |
| 18. A line of broad white scales in front of the wing-base .....  | 17. <i>tasmanicus</i> .       |
| No such scales present .....  | 18. <i>australis</i> .        |
| 19. Scales of mesonotum dark brown, a transverse band of pale brown ones in the middle: small species .....   | 19. <i>multiplex</i> .        |
| No transverse pale band on mesonotum ....   | 20.                           |



20. Large species (7-8 mm.): abdominal segments with basal greyish bands, indented in the middle; male palpi four-jointed, the joints all about equal in length, nearly one-fourth shorter than proboscis ..... 19. *crucians*.  
 Smaller species (5 mm.) ..... 21.
21. Abdomen with narrow pale bands at the bases of the segments; "deep umbrous brown, with an almost imperceptible violet reflection" ..... 21. *macleayi*.  
 Abdomen with basal lateral yellow spots, most conspicuous on segments 5-7; violet-brown in general colour ..... 22. *bupengaryensis*.

### Synonymical Notes.

1. *O. notoscriptus*, Skuse (*Culex*), Proc. Linn. Soc. N.S.W. ser. 2, vol. iii. p. 1738 (1889).

*Stegomyia notoscripta*, Theo. Mon. Cul. i. p. 286 (1901).

*Scutomyia notoscripta*, Theo. Gen. Ins. Cul. p. 19 (1905).

2. *O. purpureus*, Theo. Mon. Cul. v. p. 479 (1910).

*Molpemyia purpurea*, Theo. l. c.

Though this is only known from the female, it seems to be an almost typical *Ochlerotatus*.

3. *O. aculeatus*, Theo. Mon. Cul. iii. p. 233 (1903).

*Gilesia aculeata*, Theo. l. c.

4. *O. australiensis*, Theo. Mon. Cul. v. p. 313 (1910).

*Leucomyia australiensis*, Theo. l. c.

5. *O. vittiger*, Skuse, Proc. Linn. Soc. N.S.W. ser. 2, vol. iii. p. 1728 (1889).

*Culex vittiger*, Skuse, l. c.

6. *O. vandema*, Strick. Entomologist, xliv. p. 202 (1911).

*Culicada vandema*, Strick. l. c.

7. *O. stricklandi*, nom. nov.

*Grahamia australis*, Strick. Entomologist, xliv. p. 133 (1911), nec *O. (Culex) australis*, Erichs.

8. *O. flavifrons*, Skuse, Proc. Linn. Soc. N.S.W. ser. 2, vol. iii. p. 1735 (1889).

*Culex flavifrons*, Skuse, *l. c.*

*Grabhamia flavifrons*, Theo. Mon. Cul. iv. p. 304 (1907).

9. *O. tuberculatus*, Coq. (*Culex*), Ent. News, xvi. p. 116 (1906).

*Culicelsa westralis*, Strick. Entomologist, xlv. p. 130 (1911).

*Culicada inornata*, id. *l. c.* p. 201.

The chief variation in this species is in the scaling of the female palpi. These are always tipped with ochreous white, but have a variable number of ochreous scales scattered over the upper surface. The differences do not seem to me to be of specific value.

10. *O. vigilax*, Skuse (*Culex*), Proc. Linn. Soc. N.S.W. ser. 2, vol. iii. p. 1731 (1889).

*Culex marinus*, Theo. Mon. Cul. i. p. 396 (1901).

*Culex procax*, Theo. *l. c.* p. 415 (nec Skuse).

? *Culex vigilax*, Theo. *l. c.* p. 395.

*Culex albirostris*, Theo. (nec Macq.) Mon. Cul. iii. p. 162 (1903).

*Culicelsa vigilax*, Theo. Mon. Cul. iv. p. 382 (1907).

? *Culicelsa pseudovigilax*, Theo. *l. c.*

*Culicelsa uniformis*, Strick. Entomologist, xlv. p. 131 (1911).

11. *O. nocturnus*, Theo. (*Culex*), Mon. Cul. iii. p. 159 (1903).

Doubtfully distinct from the preceding. The male is unknown.

12. *O. alboannulatus*, Macq. Dipt. Exot., 4th Supp. p. 10 (1850).

*Culex alboannulatus*, Macq. *l. c.*

13. *O. occidentalis*, Skuse, Proc. Linn. Soc. N.S.W. ser. 2, vol. iii. p. 1729 (1889); Theo. Mon. Cul. i. p. 419 (1901).

*Culex occidentalis*, Skuse, *l. c.*

*Culicelsa similis*, Strick. Entomologist, xlv. p. 132 (1911).

*Culicelsa queenslandis*, Strick. *l. c.* p. 179.

*Culicada demansis*, Strick. *l. c.* p. 202.

Strickland's species only differ in very slight characters (chiefly the colour of the thoracic integument), and it is impossible to regard them as distinct. The species is no doubt correctly identified as *C. occidentalis*, Skuse.

14. *O. rubrithorax*, Macq. (*Culex*), Dipt. Exot., 4th Supp. p. 9 (1850).

*Culex procar*, Skuse, Proc. Linn. Soc. N.S.W. ser. 2, vol. iii. p. 1742 (1889).

The species which Theobald has identified as *C. rubrithorax* answers in every particular to Skuse's description of *C. procar*, and I have no doubt they are the same. Macquart's description is very inadequate, but since Theobald claims to recognize *C. rubrithorax*, the name may as well be retained.

15. *O. quasirubrithorax*, Theo. (*quasirubithorax*), Mon. Cul. v. p. 348 (1911).

May be only a variety of the preceding species.

16. *O. sagax*, Skuse, Proc. Linn. Soc. N.S.W. ser. 2, vol. iii. p. 1744 (1889).

This must be an *Ochlerotatus*, for Skuse refers to the "lamellæ of the ovipositor," describing them as "deep brown, elongate." In *Culex* the ovipositor is never prominent externally and has no distinct "lamellæ." Theobald is certainly wrong in his interpretation of the species: the specimens so named by him in the British Museum collection proved to be only light specimens of *C. fatigans*. I have seen no insect which answers to Skuse's description.

17. *O. tasmaniensis*, Strick. Entomologist, xliv. p. 250 (1911).

*Andersonia tasmaniensis*, Strick. l. c.

18. *O. australis*, Erichs. (*Culex*), Arch. für Naturg. viii. p. 270 (1842).

Erichson's description would apply equally well to *O. crucians*, especially as he mentions that the palpi of the male are a little shorter than the proboscis. But in the absence of proof of its erroneousness, Theobald's determination is accepted. Should this species prove to have longer male palpi, the name *australis* would have to be used for *crucians* and a new name proposed for the species at present under consideration. The Tasmanian specimens recorded by Strickland ('Entomologist,' 1911, p. 179) with some doubt as *Culex frenchii* are this species, but differ slightly from the Victorian specimens. In the latter the basal half of the hind femora is entirely pale, in the former it is mottled on the

outside, pale on the inside. Dr. J. B. Cleland has found the larvæ of this species living at a height of 6000 feet on Mt. Kosciuszko, in a shallow pool fed by a snowdrift but warmed by the sun.

19. *O. crucians*, Walk. (*Culex*), Ins. Saund. i. p. 432 (1856).

*Culicada tasmaniensis*, Strick. Entomologist, xliv. p. 181 (1911).

Walker's type is in poor condition, but quite recognizable as being the same as Strickland's *C. tasmaniensis*. The species is quite distinct from that recognized by Theobald as *C. australis*.

20. *O. multiplex*, Theo. (*Skusea*), Mon. Cul. iii. p. 293 (1903).

*Pseudoskusea multiplex*, Theo. Mon. Cul. iv. p. 192 (1907).

The specimens Theobald records from New Guinea probably represent another species; males of this species from Queensland have the claws of the middle legs unequal.

21. *O. machayi*, Skuse (*Culex*), Proc. Linn. Soc. N.S.W. ser. 2, vol. iii. p. 1746 (1889).

This species, like *sagax*, is evidently an *Ochlerotatus*, and not a *Culex*, on account of the following phrase in the original description:—"lamellæ of the ovipositor light brown, densely pubescent." Theobald erroneously regards it as synonymous with *Culex fatigans*. I have not seen it.

22. *O. hungaryensis*, Theo. (*Culex*), J. Econ. Biol. i. p. 27 (1905).

*Culicada bupengaryensis*, Theo. Mon. Cul. iv. p. 348 (1907).

#### *Unidentified Species.*

The following probably belong to the genus *Ochlerotatus*, but the descriptions are inadequate for recognition:—

*Culex camptorhynchus*, Thomson, Eugenes Resa, Dipt. p. 443 (1868).

*Culex allirostris*, Macq. Dipt. Exot., 4th Suppl. p. 10 (1850).

*Culex nigrithorax*, Macq. Dipt. Exot., 2nd Suppl. p. 9 (1847).

*Culex pseudovigilar*, Theo. Mon. Cul. iv. p. 38 (1907).—

There is no type, and nothing answering to Theobald's



description exists in the British Museum Collection. Perhaps the specimen from which Theobald's description of *C. vigilax* (subsequently renamed *pseudovigilax*) was taken was, after all, only a slight aberration of the true *C. vigilax*, Skuse.

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LVIII.—*Descriptions of new Species of Pyrochroidæ.*

By K. G. BLAIR.

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I HAVE recently been rearranging the collection of Pyrochroidæ in the British Museum, and amongst the accessions are a considerable number of undescribed species. These were for the most part contained in the Fry Collection, and collected by Doherty in the Ruby Mines district of Burma; other species obtained by him in Perak, specimens of which are also contained in the Fry Collection, have recently been described by M. Pic. In addition to these are descriptions of two species from the Nilghiri Hills, the types of which have been generously presented to the Museum by Mr. H. E. Andrewes, and one species from Sumatra, communicated by Dr. Gestro, of the Museo Civico, Genova. To M. Maurice Pic I am indebted for the loan of several types and for his identification of many species.

*Pyrochroa melanocephala*, sp. n.

Elongata, subparallela; supra rufa; capite nigro, collo rufo.  
Long. 14 mm.

*Hab.* Sikkim.

Resembles *ruficeps*, Pic, from the same locality, but that the head is black, with only the neck red. The head is transversely excavated between the eyes in the male, the cavity being filled with black hairs. The antennæ are slender and finely pectinate; the thorax is widest before the base and the elytra subcostulate.

*Pyrochroa rufipes*, sp. n.

♀. Rufa, antennis, palpis et abdomine nigris.  
Long. 14 mm.

*Hab.* Nilghiri Hills (*H. E. Andrewes*).

This species, two females of which only are before me, is very distinct in having the limbs and underside, with the exception of the abdomen, reddish testaceous. In form it closely resembles the following, and is allied to *P. testacitarsis*, Pic. The head is rather elongate, narrowed behind the eyes, with the antennæ rather stout and pectinate. The thorax is transverse, broadest a little before the base, and angulated at the sides. The elytra are almost parallel, covered with a rather dense suberect pubescence, and without a trace of costæ.

*Pyrochroa nilgiriensis*, sp. n.

♀. Elongata, subparallela; supra rufa ore nigro, infra nigra capite prothoraceque rufis.  
Long. 14 mm.

*Hab.* Nilgiri Hills (*H. E. Andrewes*).

This species is altogether red above, with the exception of the lower part of the face, which is blackish. The underside of the head and prothorax are also red, the rest, with the limbs, shining black, with a fine greyish pubescence. The head is rather broader than in the last species and very short behind the eyes; the antennæ of the female are rather short and pectinate. The prothorax is transverse, angulated at the side a little before the base. The elytra become slightly broader from the shoulders backwards, and are clothed with a suberect reddish pubescence. The tarsi are entirely black.

Five specimens, all females, are before me.

*Pyrochroa antennalis*, sp. n.

Supra coccinea, capite nigro: antennis validis, valde flabellatis; elytris explanatis, subcostulatis.  
Long. 18 mm.

*Hab.* Burma (Ruby Mines).

This striking species is easily recognized by its flattened form, with the elytra very strongly expanded and flattened behind. The head is rather small, black, narrowed behind the eyes, and transversely undulate in front. The antennæ are strongly developed and pectinate, the branches in the male being long and plate-like, but in the female shorter and more conical; in both sexes the antennæ are covered with a fine black pubescence. The prothorax and elytra and also the scutellum are bright scarlet, the elytra faintly costulate.

*Pyrochroa bifoveata*, sp. n.

Parum elongata, depressa; capite fusco, ante oculos bifoveolato; prothorace elytrisquo fulvis.

Long. 11 mm.

*Hab.* Burma (Ruby Mines).

At first sight resembles *P. diversicornis*, m., but distinguished by the structure of the head and prothorax. *P. bifoveata* has the excavation before the eyes almost traversed by a projection from the anterior ridge, causing it to appear as two deep foveæ. The antennæ are simply pectinate in both sexes, though more finely in the male. The prothorax is moderately transverse, but evenly rounded on the sides and covered with a fairly long yellowish pubescence. The elytra are strongly expanded behind and rounded at the apex.

*Pyrochroa diversicornis*, sp. n.

Parum elongata, depressa; prothorace elytrisquo fulvis; capite scutelloque nigris; antennis bipectinatis, supra serratis atque infra gracile flabellatis.

Long. 12 mm.

*Hab.* Burma (Ruby Mines).

Resembles the preceding, but smaller and not so elongate, and distinguished at once by the antennæ. The head is black, undulate in front, with the neck reddish. The antennæ of the male are bipectinate; above the pectinations are short and stout, hardly more than serrate, but the lower series are long and slender. The prothorax is transverse, evenly rounded at the sides, not narrower in front than behind. The elytra are strongly expanded behind, attaining twice the width of the shoulders, and each is separately rounded at the apex.

*Pyrochroa fulvipennis*, sp. n.

♀. Elongata, nigra, elytris scutelloque fulvis.

Long. 15 mm.

*Hab.* Borneo.

Resembles *P. longa*, Perty, in form, but the head and prothorax are of a dull black. Head nearly as wide as prothorax, more evenly rounded behind the eyes than in *P. longa*. Antennæ of female stout and serrate, similar in structure to those of *P. longa*. Prothorax hardly transverse, rounded at the sides and covered with a dense black pubescence. Elytra narrow, scarcely expanded behind, with traces of costæ.

*Pyrochroa apicipennis*, sp. n.

♀. Fere ut precedenti sed gracilior; elytris fulvis, apice nigris.  
Long. 13 mm.

*Hab.* Borneo.

Closely resembles the last species, but head and thorax relatively smaller, and the head narrows more suddenly behind the eyes. The apex of the elytra for about one-sixth of their length is black.

*Pyrochroa ruficollis*, sp. n.

♀. Elongata, parum depressa, nigra; prothorace scutelloque rufis.  
Long. 13-15 mm.

*Hab.* Java.

This species, represented by two female examples, resembles *P. dohertyi*, Pic, from which it differs in having the elytra entirely black and the underside and limbs pitchy and clothed with black hairs. The head is narrowed behind the eyes, black tinged with red on the neck. The antennæ are stout, with a black pubescence, the first joint about equal in length to the third, and from the fourth onwards stoutly pectinate. The prothorax is slightly transverse, rounded at the sides, with a shallow median furrow and lateral impressions. The elytra are narrow, subparallel, and with only faint traces of costæ.

*Pyrochroa nebulosa*, sp. n.

Elongata, subdepressa, nigra; vertice, prothorace, scutello et dimidio elytrorum antico rufis.  
Long. 15 mm.

*Hab.* Java.

Resembles *P. bipartita*, Pic, from Sumatra, but the black apical portion of the elytra is not sharply marked off from the red—in fact, the junction is very gradual, with a cloudy appearance. Furthermore, the most advanced portion of the black is in the middle and the suture is tinged with red almost to the tip. Apparently closely allied to the foregoing; the head of the male is transversely excavated between the eyes, the antennæ are moderately stout, serrate above, and finely pectinate beneath.

*Pyrochroa dimidiata*, sp. n.

Elongata, infra nigra; prothorace et scutello et dimidio elytrorum



antico fulvis; capite fusco, et dimidio elytrorum postico nigro; capite simplice; antennis maris gracile pectinatis, feminae robustioribus.

Long. 12-14 mm.

*Hab.* Sumatra.

This species resembles *P. bipartita*, Pic, but may be distinguished by the black portion of the elytra being most advanced along the suture, whence it curves backwards, to advance a little again at the extreme margin. In *bipartita*, a specimen of which M. Pic has kindly forwarded for comparison, the line of demarcation is sharper, and retreats at first from the suture, to return at a sharp angle, and finally reach the margin considerably in advance of its sutural limit. In *dimidiata* the front of the head is undulate in both sexes, while behind the eyes the head is almost angled. The branches of the antennæ are long and slender in the male, shorter and stouter in the female. The prothorax is slightly transverse, much narrower in front than behind, and thickly clothed with a reddish pubescence. The elytra are narrow, divergent behind, and distinctly striped.

Coll. Mus. Genova.

*Dendroides assamensis*, sp. n.

Parum elongatus, depressus, fulvus; prothorace postice late depresso; antennis maris graciliter, feminae validius pectinatis.

Long. 10-14 mm.

*Hab.* Assam, Sumatra.

The large eyes, closely approximated above in the male and less so in the female, indicate the genus of this species. In the male they approach more closely than in *D. niponensis*, Lewis, though rather less so than in the N. American species. The face is excavated before the eyes, the posterior side more steeply than the anterior. The antennæ are pectinate, as in *niponensis*, the branches are rather finer than in that species, but not so fine as those of *concolor*, Newm. The prothorax is slightly transverse, somewhat narrower in front than behind, with the sides evenly rounded. The disc is widely depressed, the depression almost reaching the posterior margin. The elytra are expanded and flattened posteriorly and faintly costate. The limbs and underside are pitchy brown.

There is a specimen from Sumatra in the Museo Civico, Genova, that agrees very closely with those from Assam.

*Dendroides magnificus*, sp. n.? = *D. grandipennis*, Pic.

Supra coccineus, capite nigro, inter oculos excavato ; antennis validis, pectinatis.

Long. 20–26 mm.

*Hab.* Burma (Ruby Mines).

This species, though variable in size, has a very similar facies to that of a large *P. antennalis*, m., the coloration and form of the antennæ being very similar. The head, however, is very different, being similar to that of *D. niponensis*, Lewis. The eyes are fairly approximate, with the space between them and the antennæ excavated by two narrowly oval depressions in close contiguity. There is a distinct neck, largely red, and the thorax is, as in Lewis's species, very narrow anteriorly and slightly constricted behind. The elytra are expanded behind and faintly costate. The under-side and limbs are black and shining. The antennæ are remarkably similar in both sexes, the long plate-like branches being almost as well developed in the female as in the male.

*Ischalia apicalis*, sp. n.

Picea, elytris flavis, apicibus nigro marginatis.

Long. 5 mm.

*Hab.* Siam, Burma (Ruby Mines).

Resembles *I. basalis*, Waterh., but has the dark portion of the elytra confined to a narrow margin surrounding the apical region. The inner costa from the shoulder is very short and the outer remains parallel with the outer margin and is continued almost to the apex.

*Ischalia suturalis*, sp. n.

Præcedenti similis, picea ; elytris flavis, secundum suturam fere ad apicem late fuscis.

Long. 5 mm.

*Hab.* Assam.

Resembles the former species, but that along the suture is a broad straight dark band. Though this band varies in extent and in intensity, it does not reach the submarginal costa and stops short before reaching the apex. The submarginal costa is again subparallel with the marginal, but the inner costa is longer, running to about one-third of the length of the elytron.

From *I. patagiata*, Lewis, it differs in the thorax being

depressed right up to the anterior margin, in the submarginal carina being closer to and more parallel with the margin, and in the sutural dark band not being thickened and somewhat recurrent along the submarginal area at its termination.

*Lemodes cæruleiventris*, sp. n.

Coccinea, parce pube induta, creberrime punctata, ventre pedibusque atro-cæruleis.

Long. 5 mm.

*Hab.* Queensland (Port Bowen).

Distinguished by its small size and scanty pubescence. Head and prothorax densely and coarsely punctured, causing the surface to appear almost honeycombed; the latter not so sharply protuberant on the sides as *L. coccinea*, Boh., and without any furrow on the disc. Elytra coarsely but not so densely punctured, with a very thin pubescence, and consequently not showing the marbled reflections of *coccinea*. The abdomen and limbs are of a deep shining blue-black; the antennæ entirely black, also with a blue reflection.

*Lemodes tumidipennis*, sp. n.

Ferruginea, nitida, parce punctata; prothorace medio valde constricto; elytris basin et dimidio postico tumidis; pedibus ferrugineis, femorum apicibus et tarsis testaceis.

Long.  $3\frac{1}{2}$  mm.

*Hab.* Australia.

Abundantly distinct from all its congeners in its smooth shining surface, devoid of pubescence and to a great extent of punctures; the long scattered hairs found in the other species still persist. The irregularities of surface exhibited by *L. coccinea* are immensely exaggerated; thus the prothorax is more strongly constricted in the middle, with the dorsal surface above the constriction raised on either side of the median furrow into a low hump; the elytra are strongly inflated at the shoulders and again about the middle of the base. Behind these areas the depressions on the disc and on the sides are very strongly marked, and behind them the whole of the apical half of the elytra forms one large inflated area. The swollen portions of the elytra are testaceous, while the depressions and the basal portion of the sutural area are dark ferrugineous; these portions also bear a few large punctures. The antennæ are blackish, with the terminal joint white and the basal three or four joints reddish. The legs are piceous, with the extreme apex of the femora testaceous.

LIX.—*A Synopsis of the Myxinoïds of the Genus Heptatretus or Bdellostoma.* By C. TATE REGAN, M.A.

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HEPTATRETUS.

*Eptatretus*, Cloquet, Dict. Sci. Nat. xv. p. 134 (1819).

*Homea*, Fleming, Philos. of Zool. ii. p. 375 (1822).

*Heptatrema*, Voigt, Thierr. ii. p. 529 (1832).

*Bdellostoma*, Müll. Abhandl. Akad. Berlin, 1834, p. 79.

*Polistotrema*, Gill, Proc. U.S. Nat. Mus. 1880, p. 30.

Myxinoïds with 6 to 14 branchial apertures on each side and with the external branchial ducts subequal in length.

Pacific coast of America ; Japan ; New Zealand ; Cape of Good Hope.

The specimens enumerated are those in the British Museum Collection, on which this revision is based.

*Synopsis of the Species.*

- |  |                         |
|--|-------------------------|
| I. 14 gill-openings .....  | 1. <i>polytrema</i> .   |
| II. 11 to 13 gill-openings.  |                         |
| Length of head, to first gill-opening, more than $\frac{1}{8}$ of the total length ..... | 2. <i>stouti</i> .      |
| Length of head, to first gill-opening, less than $\frac{1}{8}$ of the total length ..... | 3. <i>deani</i> .       |
| III. 10 gill-openings .....  | 4. <i>decatrema</i> .   |
| IV. 8 gill-openings .....  | 5. <i>okinoseanus</i> . |
| V. 7 gill-openings.  |                         |
| Teeth $\frac{12}{12} \mid \frac{12}{12}$ .....   | 6. <i>cirratus</i> .    |
| Teeth $\frac{8}{8} \mid \frac{8}{8}$ .....   | 7. <i>banksii</i> .     |
| VI. 6 gill-openings.   |                         |
| Teeth $\frac{12}{11 \text{ or } 12} \mid \frac{12}{11 \text{ or } 12}$ .....             | 8. <i>hexatrema</i> .   |
| Teeth $\frac{9}{10} \mid \frac{9}{9}$ .....  | 9. <i>buergeri</i> .    |

1. *Heptatretus polytrema*.

*Bdellostoma polytrema*, Girard, Proc. Ac. Philad. 1854, p. 199, and U.S. Nav. Astron. Exped., Zool. p. 252, pl. xxxiii. (1856) ; Günth. Cat. Fish. viii. p. 512 (1870).

14 gill-openings : two rows of 12 teeth on each side, the 3



anterior teeth of each row united at the base ; length of head, to first gill-opening,  $6\frac{1}{3}$  in the total length.

Chile.

1. 380 mm.

Valparaiso.

'Challenger.'

## 2. *Heptatretus stouti*.

*Bdellostoma stouti*, Lockington, Amer. Nat. 1878, p. 793.

*Polistotrema stouti*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 6 ; Everm. & Goldsborough, Bull. U.S. Fish. Bureau, xxvi. 1906, p. 226 (1907).

*Homea stouti*, Dean, Journ. Coll. Tokyo, xix. 1904, Art. 2, p. 11, fig. A, and p. 20.

11 to 13 gill-openings ; length of head, to first gill-opening,  $3\frac{1}{2}$  to  $4\frac{2}{3}$  in the total length.

California.

## 3. *Heptatretus deani*.

*Polistotrema deani*, Everm. & Goldsborough, Bull. U.S. Fish Bureau, xxvi. 1906, p. 225, fig. 1 (1907).

11 or 12 gill-openings ; two rows of 10 or 11 teeth on each side ; length of head, to first gill-opening,  $5\frac{2}{3}$  to  $6\frac{2}{3}$  in the total length.

Alaska.

## 4. *Heptatretus decatrema*, sp. n.

*Bdellostoma polytrema* (non Girard), Putnam, Proc. Boston Nat. Hist. Soc. xvi. 1873, p. 160.

10 gill-openings ; two rows of 12 teeth on each side, the 3 anterior teeth of each row united at the base ; length of head, to first gill-opening,  $4\frac{1}{2}$  to 5 in the total length.

Chile.

1-2. 420 & 480 mm. (types of the species).

Chile.

Dr. Delfin.

## 5. *Heptatretus okinozeanus*.

*Homea okinozeana*, Dean, Journ. Coll. Tokyo, xix. 1904, Art. 2, p. 11, fig. B, p. 20, and pl. i. fig. 1.

8 gill-openings ; on each side 12 teeth in the outer and 10 or 11 in the inner row ; 3 anterior teeth of outer and 2 anterior teeth of inner rows united basally ; length of head, to first gill-opening, about 4 in the total length.

Japan.

### 6. *Heptatretus cirratus*.

*Petromyzon cirrhatus*, Schneid. Bloch's Syst. Ichth. p. 532 (1801).

*Bdellostoma forsteri*, Müll. Abhandl. Akad. Berlin, 1834, p. 80.

*Bdellostoma cirrhatum* (part.), Günth. Cat. Fish. viii. p. 511 (1870).

*Eptatretus cirrhatus*, Waite, Rec. Canterbury Mus. i. 1909, no. 2, p. 2, pl. xiii.

7 gill-openings; on each side two rows of 12 teeth, the 3 anterior teeth of each row united at the base; length of head, to first gill-opening, about  $3\frac{3}{4}$  in the total length.

New Zealand.

- |            |                                       |               |
|------------|---------------------------------------|---------------|
| 1. 530 mm. | D'Urville Is., Queen Charlotte Sound. | 'Challenger.' |
| 2. 400 mm. | New Zealand.                          | Capt. Stokes. |

### 7. *Heptatretus banksii*.

*Homea banksii*, Fleming, Philos. of Zool. ii. p. 375 (1822).

*Bdellostoma heptatrema*, Müll. Abhandl. Akad. Berlin. 1834, p. 79.

7 gill-openings; on each side two rows of 8 teeth.

Southern Pacific.

### 8. *Heptatretus hexatrema*.

*Bdellostoma hexatrema*, Müll. Abhandl. Akad. Berlin. 1834, p. 79.

*Bdellostoma heterotrema*, Müll. l. c.

*Bdellostoma cirrhatum* (part.), Günth. Cat. Fish. viii. p. 511 (1870).

6 gill-openings; on each side 12 teeth in the outer row and 11 or 12 in the inner; 3 anterior teeth of outer and 2 anterior teeth of inner rows united basally; length of head, to first gill-opening,  $3\frac{1}{2}$  to  $3\frac{1}{2}$  in the total length.

South Africa.

- |            |              |                         |
|------------|--------------|-------------------------|
| 1. 700 mm. | Simon's Bay. | 'Challenger.'           |
| 2. 550 mm. | Table Bay.   | J. L. Stathan, Esq.     |
| 3. 430 mm. | False Bay.   | Dr. J. D. F. Gilchrist. |
| 4. 230 mm. | —            | Dr. Günther.            |

### 9. *Heptatretus buergeri*.

*Heptatrema cirrhatum* (non Schneid.), Schleg. Faun. Japon., Poiss. p. 310, pl. cxliii. (1850).

*Bdellostoma buergeri*, Girard, Proc. Ac. Philad. 1854, p. 199.

*Homea burgeri*, Dean, Journ. Coll. Tokyo, xix. 1904, Art. 2, p. 11, fig. C, and p. 21.

6 gill-openings; on each side 9 teeth in the outer and 9 or 10 in the inner row; 3 anterior teeth of outer and 2 anterior teeth of inner row united basally; length of head, to first gill opening,  $3\frac{1}{2}$  in the total length.

- |            |               |                        |
|------------|---------------|------------------------|
| 1. 380 mm. | Yokohama Bay. | Prof. D'Arcy Thompson. |
|------------|---------------|------------------------|

LX.—*New Species of Heterocera from Costa Rica.*—XV.

By W. SCHAUUS, F.Z.S.

[Continued from p. 433.]

*Hyrmina nubila*, sp. n.

♂. Body black; a lateral pale reddish-brown spot on collar; abdomen ventrally white. Wings black: the interspaces thinly scaled semihyaline; the veins and margins heavily marked. Fore wings: an oblique white fascia beyond cell from subcostal to near termen above vein 3. Hind wings: traces of whitish streaks on interspaces near outer margin.

Expanse 32 mm., ♀ 35 mm.; some specimens of ♂ only 26 mm.

*Hab.* Guapiles, La Florida, Esperanza, Carillo.

*Cambogia myrrha*, sp. n.

♂. Palpi buff. Head brownish; a white line between antennæ. Collar yellow, edged behind with purple-brown. Thorax purple-brown in front, yellow behind. Abdomen yellow; small dorsal reddish-brown spots; the basal spot large, purple-brown shaded with silvery steel-coloured scales. Wings yellow, the markings purple-brown shaded with silvery-grey scales. Fore wings: a broad costal shade interrupted along extreme edge by brownish-yellow spots, its hind edge irregular, reaching median at base, and suffusing with a broad postmedial shade above vein 3; small antemedial spots on median and submedian veins, also postmedially on vein 2 and inner margin; subterminal spots, suffusing partly with postmedial shade; marginal spots across veins. Hind wings: an antemedial spot on inner margin; a small spot in cell; small postmedial spots terminating in a large spot on inner margin; subterminal and marginal spots, large and suffusing between veins 3 and 4; some minute terminal spots. Underneath yellowish white; the larger markings all dull purplish brown; the small spots and spot on inner margin of hind wing absent, only the small discal spot and spots between veins 3 and 4 present.

Expanse 17 mm.

*Hab.* Carillo, Juan Vinas.

*Cambogia cingras*, sp. n.

♂. Very similar to *C. myrrha*, bright yellow, the markings reduced; the costal shade narrower and interrupted medially; the postmedial shade reduced to a thick line outbent between veins 3 and 4, suffusing with subterminal spots. Hind wings: the spots between veins 3 and 4 separated, smaller than in *C. myrrha*; the steel shadings much less apparent. Underside with the markings also reduced.

Expanse 20 mm.

Hab. Turrialba.

*Cambogia naias*, sp. n.

♀. Body and wings dark purple-red, crossed by fine interrupted silvery lines; cilia bright yellow. Fore wings: some orange spots on costa; subbasal, geminate antemedial, medial, postmedial, and subterminal lines, the two latter close together; all the lines distinctly interrupted along submedian fold; some small marginal spots. Hind wings: medial, geminate postmedial, subterminal, and marginal lines. Underneath dull roseate, with traces of a yellowish postmedial shade, which is medial on hind wings.

Expanse 22 mm.

Hab. Poas.

Another female which I do not like to consider distinct has the fore wings with large orange spots on costa and a wavy postmedial orange line. The hind wings have the base yellow, also a broad sinuous medial line.

Allied to *C. hæmatodes*, Warr.

*Cambogia zenobia*, sp. n.

♂. Palpi and frons pale brown. Body and wings bright silky yellow, with traces of faintly darker transverse lines, but not clear enough to describe; a black discal point on fore wing. Fore wings below dull roseate; subterminal yellow spots, sometimes forming a broad line; the termen yellowish at tornus, and otherwise striated with yellow. Hind wings below pale yellow; a faint roseate line near apex.

Expanse 20 mm.

Hab. Tuis, Guapiles, Juan Vinas.

*Cambogia multilunata*, sp. n.

♀. Head and thorax deep yellow, the collar and patagia



tipped with dull brown. Abdomen pale yellow, with broad segmental pale brown lines. Wings dull pale yellow; a thick terminal brown line. Fore wings: fine, irregular, brownish basal, subbasal, antemedial, and medial lines, edging greyish blotches in cell, the medial containing a small yellow spot; a distinct fuscous-brown spot on discocellular; postmedial and subterminal lines geminate, dull greyish, finely edged with brown, deeply lunular and inwardly produced on veins, the postmedial expanding above vein 5 into a large fuscous-grey patch, containing a yellow spot on costa; from near base a fine dark grey line along median and vein 4 to termen; some indistinct marginal clusters of brown scales. Hind wings slightly produced at vein 4; three thick medial lines partly coalescing on veins, and with a fuscous discal point; postmedial paler, geminate, deeply lunular as on fore wing; an irregular fine and interrupted subterminal line. Underneath similar, but much paler.

Expanse 32 mm.

*Hab.* Juan Vinas.

*Cambogia dibopha*, sp. n.

♂. Head orange-brown; a white line between antennæ. Collar grey-brown. Thorax yellow, the patagia shaded in front with orange-red. Abdomen above yellow shaded with orange-red, the posterior segments with purplish brown. Wings bright yellow, the lines orange-red. Fore wings: the lines on costa greyish brown, the colours suffusing along costal vein; a basal and subbasal line, followed by two lines interrupted below cell; a dark point on discocellular, and a line below it to inner margin, geminate between median and vein 2; a postmedial nearly straight line followed by a large grey space from vein 2 to costa, shaded with dark reddish brown, especially between veins 4 and 6, and mottled with orange-red on costa; subterminal line only visible on inner margin; marginal and terminal orange-red spots partly suffusing. Hind wings: a basal line; a medial line below discal point; postmedial and subterminal lines; a large greyish patch from vein 4 to inner margin above anal angle; marginal and terminal spots as on fore wing. Underneath whitish yellow, the markings dull greyish.

Expanse 26 mm.

*Hab.* Juan Vinas.

Intermediate between *C. insignata*, Wlk., and *C. cedon*, Dr., having the lines as in the former, with the large dark patches of the latter.

*Cambogia dione*, sp. n.

♂. Body and wings yellow; a white streak between antennæ; a broad postmedial dark lilacine grey shade with a broad projection between veins 3 and 4, not reaching termen; dark discal points; the margins of postmedial shade and other markings light orange-brown; a fine subterminal line; small marginal and terminal spots. Fore wings: a basal, subbasal, and antemedial line; the costa shaded with orange-brown except medially. Hind wings: a thick basal line; a broad medial line from near discal point to inner margin. Underneath yellowish white, the markings smoky lilacine grey.

Expanse 20 mm.

*Hab.* Sixola, Juan Vinas.

*Cambogia nympha*, sp. n.

♀. Body greyish brown. Fore wing brownish grey, except a broad apical space reaching vein 4, and a narrow terminal space from vein 3 to tornus, which are pale yellow; lines indistinct fuscous grey; a black discal point and faint medial line, and a geminate postmedial line; a dentate subterminal line on yellow space preceded by another line from vein 6 to costa; some faint marginal marks below apex and between veins 2 and 4. Hind wings: basal half dark dull grey; a medial fuscous line and geminate postmedial line; outer half pale yellow, shaded and streaked with lilacine brown; a subterminal greyish-brown shade widest near anal angle. Fore wings below dull roseate; a subterminal yellow band interrupted between veins 2 and 4 by roseate shading. Hind wings below pale yellow; some roseate striae at apex.

Expanse 21 mm.

*Hab.* Juan Vinas, Tuis.

Near *C. biteniata*, Prout.

*Cambogia dissensa*, sp. n.

♀. Head brown; a white line between antennæ. Collar and thorax greenish buff. Abdomen pale brown. Wings yellow. Fore wings: from base a cloudy grey shade for two-thirds on costa, and one-half on inner margin, its outer edge limited by a brownish faint line, projecting below vein 4, then incurved, crossed by yellow spots on costa; an antemedial yellow line, and two postmedial darker grey lines; a black discal point; terminal space with three greyish

lines from costa to vein 6, partly suffusing; traces of a subterminal lunular brownish line, followed by a greyish shade about veins 3-4 and on inner margin. Hind wings: a fine pale roseate brown medial line, a marginal pale roseate brown line, and similar terminal suffusions. Fore wings underneath whitish yellow below cell, and on outer margin below vein 6, otherwise dull roseate, with a similar subterminal line and terminal suffusions, chiefly at apex; a black discal point. Hind wings below yellow; a faint roseate antemedial line, and similar lines at apex and anal angle.

Expanse 29 mm.

*Hab.* Poas.

*Cambogia lavinia*, sp. n.

♀. Head, patagia, and abdomen above orange-red; collar deep red; thorax grey-brown; a pale buff line between antennæ. Wings yellow, thickly suffused with orange-red consisting of vague lines; a broad postmedial fuscous-grey shade, expanding below subcostal, and emitting similar shades to termen between veins 3 and 4; subterminal spots mottled with fuscous grey; terminal fuscous-grey spots. Fore wings: the costa spotted with deep yellow; a clear yellow shade beyond the dark discal point. Hind wings: the discal point circled with clear yellow. Wings below bone-colour, the markings dull fuscous grey; a fine antemedial line; a broad postmedial shade and branches; a well-marked lunular subterminal shade preceded and followed by finer lines.

Expanse 26 mm.

*Hab.* Turrialba.

*Cambogia dryantis*, sp. n.

♀. Head and collar brown; a white spot between antennæ. Thorax purplish mottled with yellow. Abdomen above shaded with reddish brown. Wings pale yellow; fuscous discal spots; the lines purplish brown; similar terminal points. Fore wings: the lines to near discal spot suffusing and enclosing numerous small yellow spots; a clear yellow band beyond cell from subcostal to inner margin, darkly irrorated on vein 2 and submedian; a broad postmedial purple-fuscous space, slightly striated with yellowish brown, narrowest on inner margin, and emitting similar shades to apex and termen between veins 3 and 4; a subterminal geminate line visible between veins 6 and 4, and 3 to inner

margin ; a lunular marginal line. Hind wings : a fine basal line ; a broad medial line on inner margin, partly suffusing with the postmedial dark shade, which is narrower than on fore wing, irregularly angled, and also with a branch to termen between veins 3 and 4 ; the subterminal and marginal lines broken into spots. Underneath paler with similar markings, but dull fuscous grey.

Expanse 20 mm.

*Hab.* Juan Vinas.

*Cambogia insueta*, sp. n.

♀. Frons orange and yellow. Vertex yellow, a white line between antennae. Collar orange. Thorax and abdomen yellow. Wings yellow, the lines brownish orange, fine, wavy, and distinct ; a broad purple-fuscous subterminal line irrorated with lustrous scales. Fore wings : a basal and subbasal line ; antemedial geminate, well apart, shaded anteriorly with purplish ; a dark discal point, followed by three lines, the first shaded with purple and lustrous scales ; minute marginal spots. Hind wings : a medial purplish-fuscous line irrorated with lustrous scales, closely followed by a lunular line, the interspace shaded with brown-orange ; a postmedial line ; the marginal line with darker points. Underneath bone-colour, the markings dull purplish grey ; discal points and distinct terminal line. Fore wings : base to postmedial darkly suffused, followed by an indistinct fine line, partly geminate. Hind wings : the medial line broad ; the postmedial fine, hardly visible.

Expanse 22 mm.

*Hab.* Juan Vinas.

*Cambogia deleta*, sp. n.

♂. Body brown, a buff shade between antennae ; a dorsal black spot at base of abdomen. Wings and cilia dull brown faintly tinged with roseate ; lines black ; traces of fine lines forming angles on costa above cell, and barely traceable to inner margin ; a minute black discal point ; three postmedial lines close together, the middle line barely visible, the outer line, more heavily marked, distinct, lunular, slightly inbent opposite cell ; subterminal and marginal lines partly geminate, darker brown shaded with fuscous towards costa ; distinct terminal black linear spots across veins. Hind wings : discal spot larger, black, contiguous to a fuscous shade edged with black ; subterminal and marginal lines very



indistinct, partly fuscous; terminal black points, the outer margin slightly rounded. Underneath paler: the postmedial line geminate, well apart, and distinct.

Expanse 19 mm.

*Hab.* Juan Vinas.

*Cambogia dryope*, sp. n.

♂. Body purplish brown; a white line between antennæ. Wings purplish brown, the lines very indistinct, darker; small black discal spots. Fore wings: small yellowish spots on costa; lines on basal half not traceable, only the line nearest cell-spot defined by some yellowish shading; the three lines beyond cell clearer, fuscous, especially the outer one, which is edged with a yellow shade widest between vein 4 and 6 and on inner margin; subterminal and marginal lines lunular, defined by faint yellowish shades; a terminal fine black line expanding at veins; cilia dark yellow with fuscous-brown spots. Hind wings: lines indistinct, except the third postmedial which is fuscous; marginal lines partly defined by yellowish mottling; terminal dark points; the outer margin crenulate. Underneath paler, the lines better defined.

Expanse 19 mm.

*Hab.* Turrialba.

*Cambogia crocina*, sp. n.

♂. Head and collar purplish brown; a white line between antennæ. Thorax yellow spotted with purplish red. Abdomen yellow with transverse reddish lines. Wings bright yellow, the markings purplish red; dark discal points; small terminal points; cilia luteous, with a single dark spot at vein 3. Fore wings: a narrow basal shade; an outcurved subbasal line, interrupted below cell; an antemedial line, outwardly expanding on veins; a medial oblique line on costa and minute spots on veins; a broad postmedial shade, narrowing on inner margin and between veins 5 and 6; subterminal and marginal spots, suffusing partly from vein 6 to costa, and between veins 3 and 4, forming an irregular shade from postmedial to termen. Hind wings: a basal spot; a medial line on inner margin; the postmedial sinuous, constricted beyond cell; subterminal spots geminate; marginal spots. Underneath paler, the hind wings with only the discal point and postmedial shade.

Expanse 18 mm.

*Hab.* Sixola.

*Cambogia guapa*, sp. n.

♂. Head and abdomen above brown; a white line between antennæ. Thorax purplish, the patagia tipped with yellow. Wings deep yellow. Fore wings: the costal margin to near apex purplish, with yellow streaks on extreme costa; traces of pale brown subbasal, antemedial, and medial fine lines, the last followed by a dark point in cell; a broad postmedial purplish shade, its outer edge somewhat dentate, followed by two irregular lines of small lilacine brown spots and striæ; terminal dark points. Hind wings: a broad subbasal purplish shade; a discal point; a broad postmedial shade, outwardly expanding between veins 2 and 4; the markings on outer margin more in the form of striæ; terminal dark points at veins 3 and 4. Underneath paler; the postmedial shade crossed by a pale yellowish line; the marginal markings more linear, but almost obsolete on hind wing.

Expanse 18 mm.

*Hab.* Guapiles.

Superficially like *C. crocina*, Schs., but quite distinct.

*Cambogia elongata*, sp. n.

♂. Palpi and frons brown. Vertex buff, a whitish shade between antennæ. Thorax and abdomen buff shaded with dull roseate brown; a transverse black spot on abdomen at base. Wings and cilia yellow-buff, the lines dull roseate brown; black discal spots. Fore wings: five lines before cell-spot, outbent on costa, wavy below; beyond cell lines on costa inbent; three postmedial lines, from which a darker shade extends to termen between veins 3 and 4; subterminal lunular, partly geminate; marginal line finer, also partly lunular; terminal dark spots, partly linear. Hind wings: a subbasal and antemedial line; postmedial lines connected by a greyish shade; other lines indistinct and irregular; outer margin faintly curved; the inner margin prolonged, giving a distinct appearance to the wing. Underneath paler, the postmedial and subterminal lines more distinct.

Expanse 19 mm.

*Hab.* Sixola.

*Rhodomena electa*, sp. n.

♂. Antennæ pectinated. Palpi black fringed with white. Head and abdomen white, the latter with fuscous segmental

lines and dorsal irrorations. Collar and thorax pale green. Fore wings pale green: spots and markings black edged with white; a basal spot extending as a thick line to submedian; some antemedial black scales on median, a spot on costa, and a small spot on inner margin; third costal spot, not quite medial, forming part of an irregular slate-grey band, interrupted in cell, the lower portion surrounded by pale reddish scales, except on inner margin, these scales outwardly edged by a very fine broken black line; a fine black streak on discocellular and a spot above it on costa; a fifth costal spot postmedially; a small spot from veins 5-4, and black points on other veins; subterminally a costal spot to vein 7, an irregular spot from 6 to below 5, preceded and followed by reddish scales, and an irregular band from vein 3 to inner margin preceded by reddish scaling; some terminal black spots, partly crossed or connected by an interrupted black line, these spots extending on white cilia. Hind wings white, showing the fine postmedial and broad subterminal fuscous shade of underside. Fore wings below white, the spots as above black, but duller.

Expanse 31 mm.

*Hab.* Turrialba.

Allied to *R. pomponia*, Dr.

*Rhodomene excelsa*, sp. n.

♀. Palpi black, shaded with white at base. Frons white. Vertex, collar, and thorax green. Abdomen white. Fore wings dark green; a basal roseate fascia, bordered on either side with black; an antemedial white fascia partly shaded with roseate, outangled in cell, expanding towards base below cell, followed by a black spot on costa, a small spot in cell anteriorly, and an incurved broad black line from cell posteriorly to inner margin; a postmedial black line, oblique from costa to below vein 5, straight to vein 2, and then in-bent to inner margin, followed by a triangular roseate space from costa to below vein 5, a smaller triangular space from inner margin to vein 2, each containing a green spot on margin, and an intermediate irregular roseate space, emitting a similar broad streak between veins 3 and 4 to termen; a subterminal roseate spot from costa to vein 6 containing a small black spot on costa; a subterminal dark brown line edged with black from veins 6-4, and a similar fine wavy line from vein 3 to inner margin, where it is outwardly shaded with roseate; cilia green shaded with black at veins. Hind wings whitish grey. Fore wings below white; ante-medial and medial fuscous spaces not reaching costa; a large

black subterminal space between veins 4 and 6, and duller shades from vein 3 to inner margin. Hind wings below white; a black discal point; a fine dark postmedial line, angled between veins 3 and 4; a fine subterminal dark line.

Expanse 35 mm.

*Hab.* Poas.

*Hydriomena vernata*, sp. n.

♀. Palpi dark grey tipped with buff. Head green; a geminate black spot on frons; a large black spot on vertex. Collar and thorax greenish, the latter spotted with black. Abdomen white. Fore wings green; a basal fuscous patch not reaching inner margin, and crossed by a fine, angled, green line; subbasal, antemedial, and medial fuscous-brown lines, rather broad, straight on costa, outangled in cell, the last followed by a broad white space to postmedial; this space narrow and tinged with green on costa, constricted between veins 5 and 4, and almost obliterated by green and fuscous mottling, outwardly expanding from vein 4 and edged by the postmedial line and medial line, which are inversely lunular; the postmedial is somewhat dentate above vein 4 and forms a rather large spot on costa; the subterminal consists of irregular blotches suffusing from vein 5 to costa, and connected by a fine line at vein 6 with an apical spot; small terminal spots between the veins. Hind wings white.

Expanse 27 mm.

*Hab.* Turrialba.

*Hydriomena picturata*, sp. n.

♀. Palpi dark grey. Head white, the vertex shaded with green. Collar and thorax green, the patagia irrorated with black. Abdomen above greyish, irrorated with dark brown; subdorsal fuscous-brown spots at base. Fore wings: the base green, limited by a black line outwardly oblique from costa, expanding into a spot edged with white on inner margin; space beyond line roseate brown, shaded with white and rosy buff on costa; scattered black irrorations chiefly on antemedial space, on veins postmedially, and at base; some black striae on costa; traces of an oblique antemedial dark line, inbent at fold, angled and outbent along submedian as a thick black line, almost reaching postmedial, curved and inbent on inner margin, forming a hook filled in



with dull black; a fine black line on discocellular; postmedial fine, black, inangled at vein 5, then outcurved, followed on veins by short black streaks; subterminal broader, wavyly outcurved, slate-black, joined at vein 6 by a velvety-black streak from apex; termen below apex and at tornus green irrorated with pale blue; a terminal roseate-brown line spotted with black. Hind wings silky grey. Fore wings below silky grey; a fuscous streak on discocellular; a fine fuscous postmedial line; a broad outcurved subterminal fuscous shade. Hind wings below silky grey irrorated with dull grey; a discal point, angled outer line, and marginal shade.

Expanse 26 mm.

*Hab.* Juan Vinas.

*Hydriomena confusa*, sp. n.

♀. Palpi fuscous grey, paler at tips. Head and thorax green mottled with darker green and black. Abdomen grey-buff; a dorsal fuscous streak, and slate-black tuft at base. Fore wings green, spots and lines fuscous brown, becoming black on inner margin; a basal streak from costa to submedian; a curved, lunular subbasal streak, most heavily marked on margins; an antemedial spot on costa suffusing with subbasal in cell; medial fascia broad from subcostal to inner margin, outwardly crossed by a wavy green line; postmedial heavy on costa, narrow, lunular from vein 7 to inner margin; subterminal lunular, geminate, filled in with brownish green; an interrupted terminal black line; cilia fuscous grey spotted with green. Hind wings whitish shaded with grey-brown; a terminal fuscous line; an indistinct subterminal line. Fore wings below greyish; costa whitish buff, spotted with black; a dark line on discocellular; a postmedial shade slightly outcurved below subcostal; a broad subterminal fuscous shade from veins 4-7. Hind wings below whitish thickly irrorated with brown; a dark discal point; traces of a dark postmedial and subterminal line.

Expanse 32 mm.

*Hab.* Poas.

Near *H. fassli*, Dogn.

*Hydriomena tectoria*, sp. n.

♀. Palpi coal-black. Head and thorax pale green, with large coal-black spots on frons, vertex, and patagia. Abdomen dorsally black, crossed by white segmental lines. Fore

wings: costa green, with large coal-black spots, separated by green or white geminate lines divided by brownish lines; basal half from subcostal to submedian slate-grey, irrorated with black and showing no distinct lines; postmedial space green, with dark irrorations beyond discocellular and on vein 3, crossed by postmedial fuscous line, which is broad from costa to vein 4, then fine to inner margin; the green portion beyond postmedial line is partly darker green and with black points on veins 4-7; subterminal broad, pale chocolate-brown edged with black; termen green, with some round fuscous marginal spots, outwardly edged with white, and triangular terminal black spots at veins. Cilia roseate brown. Hind wings silky white; a terminal dark line; cilia brownish white. Wings below glossy greyish white. Fore wings: a broad outcurved postmedial fuscous shade, preceded and followed by a creamy-white spot on costa; a subterminal black shade, expanding on costa to apex; marginal clearer white spots between the veins. Hind wings: a postmedial and a subterminal fuscous shade, evenly curved.

Expanse 29 mm.

*Hab.* Poas.

Allied to *H. confusa*, Schs., but the hind wings and underside very different.

*Hydriomena furinæ*, sp. n.

♀. Palpi outwardly dark brown, tipped with grey. Head pale olive-green. Collar and thorax brownish green. Abdomen above olive, with a few dark irrorations, and a geminate dorsal black line on basal segment. Fore wings greenish grey; antemedial space olive, with a few scattered reddish scales, inwardly edged by a subbasal black line, oblique from costa across cell, finer below cell, and narrowly edged with white on basal side, outwardly limited by a fine nearly straight black line, and crossed by a rather broad fuscous-grey line; on inner margin from subbasal to beyond medial line a broad curved black fascia; postmedial black, oblique from costa to vein 6, where it is followed by a short black streak below 6, inset and oblique from 6-4, wavy, very fine, and interrupted from 4 to inner margin; the postmedial is partly followed by some roseate shading; subterminal rather broad, irregular, lilacine grey, shading to fuscous brown on costa and inner margin, and faintly edged with white; a black line from subterminal at vein 6 to apex, interrupted by vein 7. Hind wings whitish shaded with grey; a faint postmedial line and broad subterminal greyish

shade. Underneath silky whitish grey, with darker post-medial and subterminal shades, and a small discal spot on hind wings.

Expanse 36 mm.

*Hab.* Juan Vinas.

*Hydriomena lucifuga*, sp. n.

♀. Body fuscous grey. Fore wings fuscous grey tinged with brown, and with dull reddish-brown irrorations forming vague antemedial and medial shades, partly outlined by black irrorations; traces of fine basal, postmedial, subterminal, and marginal lines, the latter lunular. Hind wings dark grey. Wings below dark silvery grey, partly irrorated with still darker grey scales; faint traces of a postmedial fuscous shade. Vein 6 on fore wing from near end of areole.

Expanse 31 mm.

*Hab.* Poas.

Found in dark humid forest at about 8000 feet elevation.

*Hydriomena cydippe*, sp. n.

♂. Antennæ simple. Palpi fuscous tipped with white. Head yellowish buff. Collar and thorax reddish brown with some black spots. Abdomen greyish irrorated with brown; anal segments fuscous. Fore wings brownish red, the lines broad, fuscous brown, uneven; basal line not reaching inner margin; subbasal outbent; antemedial oblique from costa, perpendicular from cell to inner margin, very broad, suffusing with medial line in cell posteriorly and just below it; postmedial with its outer edge lunular, finer from vein 3 to inner margin; subterminal expanding outwardly from above vein 7 to vein 4, edged by a dentate black line, inwardly broadly black between 6 and 4, and mottled with red just below 4; irregular terminal black spots between the veins, and some black striæ towards apex, which is spotted with black; cilia black, mottled with grey at veins. Hind wings whitish shaded with brownish grey; a fine dark postmedial line and irregular subterminal shade. Wings below greyish brown. Fore wings: a postmedial fuscous shade, heaviest on costa; a subterminal fuscous shade below vein 6. Hind wings: some brownish irrorations; a black discal point; postmedial and subterminal dark shades.

Expanse 30 mm.

*Hab.* Volcano Turrialba.

Looks rather like *Rhodomena cydra*, Dr., which has ciliated antennæ.

*Hydriomena gosala*, sp. n.

♂. Antennæ simple. Head buff. Thorax and abdomen grey-brown, thinly irrorated with reddish scales, the abdomen crossed by segmental black lines. Fore wings dull olive thinly irrorated with red scales; veins on outer half mottled grey and roseate; fuscous-brown costal spots at origin of lines, also one at base and one at apex; antemedial and medial lines fine, fuscous, and a broad fuscous shade between them; postmedial fine, dentate and oblique to vein 4, outcurved below 4 and below 3, finely wavy from 2 to inner margin; subterminal geminate from costa to vein 4 and on inner margin, filled in with fuscous brown; a terminal black line interrupted between veins. Hind wings whitish shaded with grey-brown; a terminal fine dark line; cilia shaded with black at veins. Wings below whitish grey. Fore wings: a postmedial small black spot on costa; a large fuscous shade at apex. Hind wings: a fine lunular postmedial line and indistinct subterminal shade.

Expanse 30 mm.

*Hab.* Poas.

Allied to *H. algosa*, Dogn.

*Eriopygidia daphne*, sp. n.

♂. Palpi light brown, the segments darker streaked laterally. Head light brown. Collar pale green. Thorax green streaked with fuscous. Abdomen light brown, shaded with reddish brown dorsally. Fore tibiæ reddish spotted with black. Fore wings green; costa finely red, interrupted by the large black costal spots; subbasal fascia black, narrow, consisting of a spot on costa, a small spot in cell; a spot below cell outangled close to median, and an outbent line on inner margin, all connected outwardly by a fine whitish line; antemedial broader, consisting of two spots on costa, a large spot in cell, and one from median to inner margin, black, thinly irrorated with red and edged with darker green; medial fascia very broad, limited by postmedial line, its margin inversely lunular, the inner vertical, the outer oblique from costa, inangled at vein 5, then slightly outcurved, black, irrorated with red, and mottled with green, chiefly in cell and beyond it, the margins being faintly edged with whitish green; a fuscous subterminal shade on costa, crossed by a greenish line; an oblique green shade from postmedial green area to apex, and below it a large fuscous shade between



veins 4 and 6; below vein 4 and below vein 3 angled white subterminal lines edged on either side with fuscous; below vein 2 a narrow fuscous shade; the green space between postmedial line and subterminal shades is crossed by a darker green line connecting fuscous points on veins; large terminal black spots; cilia finely red at base, outwardly mottled with black. Hind wings: the base and inner margin broadly fuscous brown, otherwise dark vermilion, this colour extending on the dark space and forming a faint postmedial line. Wings below reddish; fore wings with a black space below cell from base to beyond middle, and some black irrorations near apex; hind wings with a black discal point, a broad postmedial lunular black shade, and faint subterminal line.

Expanse 36 mm.

*Hab.* Juan Vinas.

Near *E. commutata*, Dogn.; the upperside is like *E. flavo-limbarioides*, Dogn., the underside like *E. radiosa*, Dogn.

*Psaliodes electa*, sp. n.

♀. Palpi brown, outwardly shaded with fuscous. Head luteous buff. Collar and thorax rust-red. Abdomen grey-brown. Fore wings: a little less than basal half rust-red, broadly mottled with dull violet-brown at base, and crossed by a similar antemedial shade; a fuscous, interrupted, medial line, preceded by a silvery spot on costa, and marked by similar spots in cell, above and below submedian fold, and on inner margin; outer half dull violet-brown, somewhat paler on termen; a black point at end of cell; a subterminal silvery-white line, interrupted and outset at vein 6, forming two lunules from 6 to 4, incurved below 4, finer, and interrupted by veins, followed from 6 to 4 by a fuscous line and then a rust-red shade; cilia with black spots. Hind wings greyish white; a postmedial and a subterminal dark grey shade. Fore wings below similar but duller. Hind wings below: basal half yellowish, thickly irrorated with brown; a black discal spot; outer half yellow-brown, with a finely dentate darker postmedial line.

Expanse 20 mm.

*Hab.* Poas, Turrialba.

Closely allied to *P. miniata*, Warr.

LXI.—*Descriptions of Seven new Species of Heterocera belonging to the Subfamily Ophiinae.* By HERBERT DRUCE, F.L.S. &c.

*Anua xylochroa*, sp. n.

*Male*.—Head, antennæ, palpi, collar, tegulæ, thorax, abdomen, and legs pale brown. Primaries pale brown, crossed by three darker brown waved bands extending from the costal to the inner margin; a dark brown spot at the end of the cell and a rather large darker brown marking close to the base on the inner margin; the fringe brown: secondaries brown, darkest near the outer margin; the fringe whitish from the apex to the middle of the outer margin, then brown to the anal angle. Underside: both wings pale brown, palest from the base to the middle.

Expanse 3 inches.

*Hab.* W. Africa, Upper Kasai District, Congo Free State (*P. Landbeck, Mus. Druce*).

*Achæa chrysopera*, sp. n.

*Male*.—Head, antennæ, palpi, and front of the thorax blackish brown; collar, tegulæ, thorax, and abdomen reddish brown; the anal tuft dark brown. Primaries reddish brown, shaded with lighter brown on the costal margin; several indistinct, narrow, waved brown lines cross the wing from the costal to the inner margin; a large greyish-white half circular spot on the costal margin close to the apex: secondaries black, broadly bordered from the apex nearly to the anal angle with bright orange-yellow; the anal angle shaded with reddish brown, the fringe reddish brown. Underside: primaries yellowish brown, palest in the middle; a streak at the base and a large mark at the anal angle black: secondaries yellowish brown, with a marginal row of black points.

Expanse  $2\frac{1}{4}$  inches.

*Hab.* East Africa, Dar-as-Salaam (*Mus. Druce*).

*Achæa leucopera*, sp. n.

*Male*.—Head, antennæ, palpi, collar, tegulæ, thorax, abdomen, and legs brown. Primaries from the base nearly to the middle of the cell dark brown, then pale brown; a narrow waved white line crosses the wing from the costal to the inner margin; a black spot at the end of the cell, beyond which two fine black lines cross the wing; a reddish-brown

spot close to the apex; the outer margin of the wing dark brown, the marginal line black, the fringe brown; secondaries dark brown, the apex and half the outer margin white. Underside: primaries dark brown, the apex broadly white, the inner margin and base yellowish white; a dark brown spot at the end of the cell and a fine waved brown line beyond the cell extending from the costal to the inner margin; secondaries dark brown, crossed about the middle from the costal to the inner margin by two waved dark brown lines; a dark brown spot at the end of the cell; the apex white; a submarginal waved white line.

Expanse  $2\frac{1}{4}$  inches.

*Hab.* West Africa, Bitje, Ja River, Cameroons, 2000 feet; dry season (*Mus. Druce*).

*Achwa sarcopasa*, sp. n.

*Male*.—Head, antennæ, palpi, collar, tegulæ, thorax, and abdomen pale fawn-colour. Primaries pale fawn-colour, crossed from the costal to the inner margin by two greyish-white lines, the first nearest the base, the second beyond the cell; the outer margin of the wing dark fawn-colour, shaded with greyish white; the fringe greyish fawn-colour; secondaries yellowish white, shaded with pale brown on the inner and outer margin; a wide submarginal black band extends from the apex to the middle of the wing below the cell; the fringe white. Underside greyish white: primaries with a large black mark close to the anal angle.

Expanse  $2\frac{3}{4}$  inches.

*Hab.* Madagascar (*Mus. Druce*).

*Ophisma pyrosticha*, sp. n.

*Male*.—Head, antennæ, palpi, collar, tegulæ, thorax, abdomen, and legs dark brown. Primaries dark reddish brown; a grey spot at the end of the cell; a waved greyish-white line beyond the cell extending from the costal margin nearly to the anal angle, but not reaching it, and a greyish-white spot at the apex; an orange-brown spot on the inner margin nearest the anal angle; the fringe brown; secondaries blackish brown; the fringe yellowish brown on the outer margin. Underside: both wings pale greyish brown, both wings with a submarginal wide darker brown band.

Expanse 2 inches.

*Hab.* S.E. Peru, Santo Domingo, 6000 feet (*Ockenden, Mus. Druce*).

*Parallelia arcifera*, sp. n.

*Male*.—Head, antennæ, palpi, collar, tegulæ, thorax, abdomen, and legs brown. Primaries brown, crossed near the base from the costal to the inner margin by a dark brown line; a wide dark brown band crosses the wing from the costal to the inner margin, where it comes to a point; the band is much angulated on the outer side; a dark brown spot at the apex: secondaries uniformly dark brown; the fringes of both wings brown. The underside brown.

Expanse  $1\frac{3}{4}$  inch.

*Hab.* West Africa (*Mus. Druce*).

*Ercheia chionopera*, sp. n.

*Female*.—Head, antennæ, palpi, collar, tegulæ, thorax, abdomen, and legs dark brown; the thorax with some grey hairs mixed with the brown scales. Primaries dark brown, palest in the middle; a dark brown spot at the end of the cell; a waved white line near the base extending from the costal to the inner margin; a second brownish-white line beyond the cell; the fringe dark brown: secondaries dark brown, palest at the base, the apex white. Underside: primaries pale brown, the apex and a marginal row of small spots white: secondaries as above.

Expanse  $2\frac{1}{4}$  inches.

*Hab.* West Africa, Victoria, Cameroons (*Mus. Druce*).

LXII.—*Descriptions and Records of Bees*.—XLIV.

By T. D. A. COCKERELL, University of Colorado.

*Xylocopa lateralis*, Say.

A female from Antigua, Guatemala (*W. P. Cockerell*), is referred with assurance to *X. lateralis*, hitherto known only in the male. The face is, of course, entirely black. Except for the fact that the wings are translucent reddish brown, with only a faint pinkish iridescence (instead of fuscous, shining blue), and the anterior tarsi have all the hair on inner side red, the insect seems not to differ from the Brazilian *C. crotolaria*, Schrottky. The width of the abdomen is  $8\frac{1}{2}$  mm. Superficially the insect looks exactly like *X. micans*, Lep.



*Xylocopa wilmattæ*, sp. n.

♀.—Length about 32 mm. ; anterior wing 24.

Entirely black, with black hair ; structure of *X. brasiliannorum*, but larger, the brown-black wings with bluish-green iridescence ; clypeus very broad, with very large punctures, the median smooth line poorly developed ; antennæ practically all dark ; tegulæ black ; median process of posterior tibia strongly bifid.

*Hab.* Guatemala City, Guatemala (*W. P. Cockerell*).

*Xylocopa wilmattæ gualanensis*, subsp. n.

♀.—Length about 29 mm. ; anterior wing 21.

Wings with the same green iridescence, but the central part also with strong purple tints ; apex of scape and of second antennal joint a lively red ; median process of posterior tibiæ with the upper tooth obsolete, represented by a low rounded lobe ; third antennal joint proportionately shorter than in *wilmattæ*.

*Hab.* Gualan, Guatemala, Feb. 17, 1912 (*W. P. Cockerell*).

True *X. brasiliannorum* (L.), which I possess from Jamaica and the Argentine Republic, has the wings with strong rosy-purple tints, more or less golden about the middle, but not at all bluish green. The anterior wings are 19 to 20 mm. long.

Another species, which I have heretofore confused with *X. brasiliannorum*, must now be separated.

*Xylocopa mexicanorum*, sp. n.

♀.—Anterior wing 22 mm. long.

Wings dark fuliginous, with magnificent colours, the basal two-thirds prevailingly violet, the apical third very bright blue-green ; clypeus evidently narrower than in *X. wilmattæ*, and the teeth of labrum closer together ; flagellum, except at base, obscure coffee-brown beneath ; smooth area on clypeus very well developed ; process on hind tibiæ as in *gualanensis*.

*Hab.* Rio Nautla, Vera Cruz, Mexico, March 18 ; two at flowers of plant no. 18 (*C. H. T. Townsend*).

Much larger than *X. nasica*, Pérez, and with the interocellar space rough and punctured.

*Xylocopa fimbriata*, Fabr., var. *motaguensis*, nov.

A female from Gualan, Guatemala, Feb. 1912 (*W. P. Cockerell*), has the wings a fine blue-green, bluer in the middle, and the broadly interrupted transverse frontal carina has its divisions longer and larger than in a specimen collected by W. W. Brown, Jun., at Saboga Island, Panama. The Panama insect also has the wings quite differently coloured, with no bright tints, but washed with obscure golden green, the apical field a little purplish. Lepeletier described *X. cornuta*, Lep., usually considered a synonym of *frontalis*, as having the frontal keel interrupted, whereas *fimbriata* was said to have it entire. Both came from Cayenne. According to the characters given by Lepeletier, both the Guatemala and Panama insects should be *cornuta*. Pérez describes great colour-variation in the wings of *X. fimbriata*. The colour of the wings of *cornuta*, as described by Lepeletier, accords sufficiently with the Panama insect. If Lepeletier's diagnosis of *fimbriata* is correct it is probable that *X. cornuta* is a good species, and the insect now described will then stand as *X. cornuta motaguensis*.

*Agapostemon nasutus gualanicus*, var. n.

♂.—Metathorax usually very blue; anterior and middle femora with much black or fuscous on the basal half; hind femora entirely black behind; hind tibiae largely pale brownish; black abdominal bands very broad.

*Hab.* Gualan, Guatemala (*W. P. Cockerell*, 2); four males.

This appears to be a dimorphic form of *A. nasutus*, Sm., the typical form of which is abundant at Gualan. The broader abdominal bands and darker legs give it a distinct appearance.

I cannot separate the Gualan females into two lots.

*Ceratina amabilis rhodochrysea*, var. n.

♀ ♂.—Abdomen not so purple, more salmon-red, the hind margins of the segments broadly suffused with gold; head and thorax a bluer green.

♂.—Vertex dark purple-blue; face-markings consisting of a very large and thick reversed T on clypeus, and small triangular lateral marks (the female has no lateral face-marks, the lateral spots being clypeal); greater part of labrum and a small spot on each mandible cream-colour; middle and posterior femora angled below, the middle very obtusely; apex of abdomen with the sides convex and the

median tooth triangular, broad and short; fifth ventral segment with a pair of strong sharp apical spines. The end of the abdomen resembles that of *C. azteca*, but the median tooth is much shorter and broader.

*Hab.* Quirigua, Guatemala, Feb. 10, 1912; one of each sex (*W. P. Cockerell*, 16).

This was taken with true *C. amabilis*, Ckll., but the coloration is peculiar, and it seems best to give it a varietal name. In certain lights the gold of the abdomen shines greenish.

*Ceratina wilmattæ*, sp. n.

♀.—Like *C. amabilis*, but perhaps usually larger; the abdomen of a darker crimson-red, less strongly and densely punctured, especially on the fourth segment; wings very red; green of head and thorax more or less suffused with golden; vertex, and mesothorax more or less, dark bronze; pale spot on clypeus short though large, not much longer than broad; no lateral clypeal spots; anterior tibiae with a yellow spot at base, but no stripe.

*Hab.* Quirigua, Guatemala; two at yellow golden-rod-like flower (*W. P. Cockerell*).

Very close to *C. amabilis*, but, I believe, distinct.

*Ceratina ignara*, Cresson.

Two females and a male from Lake Amatitlan, Feb. 5 (*W. P. Cockerell*), must surely belong to *ignara*, as the females agree closely with Cresson's description. Compared with a specimen of *C. abdominalis*, H. S. Smith (from the type lot), they are almost identical, except that the wings are not nearly so dark, and especially not so red. The male (unknown to Cresson) differs considerably from Smith's account of male *abdominalis*, having the following salient characters:—Eyes very prominent, converging below; clypeus light yellow except the broad lateral margins; small elongate lateral face-marks, away from eye, pointing obliquely upwards and mesad; labrum black, with a minute pale dot; mandibles black, with the apex dark red; end of abdomen with a little tuft of hair; seventh segment produced into a very large broad truncate plate, very shallowly emarginate in the middle. The clypeal mark in the females is large. The sides of the apical plate in the male are much less sloping than in *abdominalis*.

*Ceratina regalis*, sp. n.

♂.—Length about 8 mm.

Exceedingly brilliant shining blue, with strong bluish-green tints on face and base of abdomen, a green suffusion also on scutellum and post-scutellum; head very strongly and densely punctured; cheeks strongly and sparsely punctured, the upper part rather closely punctured in front and impunctate posteriorly; antennae black, the flagellum with a whitish pruinosity; broad lower margin of clypeus (narrower at sides, deeply notched above in middle), short elongate lateral face-marks (separated from the light colour on clypeus), patch (notched above) in middle of labrum, and a very large subtriangular patch on each mandible, all cream-colour; mesothorax with small punctures, not dense except at sides; thorax without light markings; area of meta-thorax granular, rather poorly defined, plicate basally; femora blue (especially behind), the middle and hind ones obtusely angled below; tibiae black, anterior ones greenish behind; tarsi dark, with white hair, except on inner side, where it is yellowish; tegulae rufo-piceous. Wings strongly reddish infuscated, pallid basally; stigma and nervures dark. Abdomen with a broad pure black striated band across second and third segments, not reaching hind or lateral margins; seventh segment inconspicuous, appearing ventral, obtusely bilobed in the manner of *C. cobaltina*, but the lobes not so far apart; fifth ventral segment bispinose; venter of abdomen with glittering white hair, except the apical part, where it is brownish.

*Hab.* Gualan, Guatemala, Feb. 15, 1912 (*W. P. Cockerell*).

Resembles *C. cobaltina*, Cresson, differing by the notched clypeal mark, the closely punctured pleura, the darker wings, the absence of a stripe on anterior tibiae, and the colour of the abdomen. From *C. polita*, Friese, it is readily known by the structure of the apex of the abdomen.

*Ceratina quinquemaculata*, sp. n.

♀.—Length a little over 7 mm.

Rather slender; head, thorax, and abdomen shining dark olive-green; face rather narrow; pubescence very scanty; head with bright chrome-yellow markings as follows—a broad bar on clypeus (almost reaching upper and lower margins, but not at all produced laterally), a large spot on each side of clypeus, a bar like that on clypeus, but smaller, on each side close to eyes (its middle a little below level of



antennae), and a long broad stripe (pointed below) on cheeks; labrum and mandibles entirely dark, middle of labrum rugose, with large punctures; face smooth, with scattered large punctures; vertex with large punctures; mesothorax smooth on disc, anteriorly with close small punctures, the posterior margin and the scutellum with very numerous minute punctures; tubercles bright chrome-yellow or orange; area of metathorax finely granular; tegulae rufo-piceous. Wings dark reddish fuliginous; stigma dark and opaque. Legs black (the hind legs have collected white pollen); spurs pale ferruginous. Abdomen clavate, narrowed basally; first segment small, shining and impunctate; following segments with close fine punctures, the apical ones rugose as usual.

*Hab.* Antigua, Guatemala (*W. P. Cockerell*).

The face-markings strongly suggest *C. maculifrons*, Sm., but that is a more robust species, with a densely punctured head, very coarsely punctured thorax, &c. *C. punctulata*, Spin., is another species with the same general type of markings, but it has long, continuous, lateral face-marks and is very strongly punctured on head and thorax.

*Ceratina xanthostoma*, sp. n.

♂.—Length about 10 mm.

Head rather large, the face with very large more or less confluent punctures; the following markings are primrose-yellow—clypeus (except rather broad lateral, very narrow upper, and narrow lower margins, the last rufo-fuscous), small thorn-shaped lateral marks (at one point touching yellow of clypeus), labrum (except margins and two large spots), and rather small spot on mandibles; no yellow on cheeks or thorax; antennae black; sides of face bright green, sides of clypeus dark purplish, supraclypeal region black, front suffused with crimson, vertex dark green, with a crimson band; cheeks dark blue-green, smooth, with a very well-defined band of punctures; mesothorax purplish black, with rather strong scattered punctures, the five impressed lines very distinct: scutellum yellowish green, rather closely punctured; postscutellum blue-green, with very small punctures; pleura very strongly and quite closely punctured, black, the posterior margin bluish; metathorax black, the area suffused with green; area of metathorax short, pointed posteriorly in middle, sharply bounded, its surface finely plicate and with a median keel; just below the boundary of the area, on each side, is a furrow; tegulae light rufous, dark

at base. Wings smoky translucent, not reddened; stigma and nervures dark reddish. Legs black, anterior femora dark blue behind; middle and hind femora obtusely angled below; spurs dark reddish; hair on inner side of tarsi light ferruginous; trochanters with a yellow apical band; anterior tibiae with a small yellow streak. Abdomen bronzy black and yellow-green, the apical part bright golden green; first segment punctured in middle of disc and narrowly along hind margin; second segment more closely and finely punctured than third; seventh segment broad, shaped much as in *C. mexicana*, but the apical angle much less acute and the sides on each side of it much less concave; sixth ventral segment deeply excavated in middle, but not spined; the seventh dorsal has a little tuft of yellow hair at apex and one at each corner, these contrasting with the white hair of the ventral surface.

*Hab.* Gualan, Guatemala, Feb. 18, 1912 (*W. P. Cockerell*).

In the table by H. S. Smith (Trans. Amer. Ent. Soc. xxxiii. p. 116) this runs to *C. mexicana*, Cresson, to which it is evidently allied, but it differs in colour (e. g., *mexicana* has the face-marks "white or yellowish," the flagellum pale brown beneath, &c.) and in the structure of the apex of the abdomen.

*Ceratina xanthostoma rufipennis*, var. n.

♂.—Length about 8 mm.

Wings deeply stained with red; sides of face yellowish green; lateral and hind margins of mesothorax green; scutellum suffused with crimson anteriorly; area of metathorax less distinctly defined, very narrow (short) at sides, suffused with blue, the median part distinctly tricarinate; pleura a brilliant steel-blue, purplish in middle and green just below wings; a small yellow spot at base of anterior tibiae, but the stripe evanescent. Neither in this nor in typical *xanthostoma* is there any sign of the pale line on lower anterior orbits found in male *mexicana*.

*Hab.* Gualan, Guatemala, Feb. 18, 1912 (*W. P. Cockerell*).

This looks like a distinct species, but I believe it is only a variety of *C. xanthostoma*.

*Dianthidium gualanense*, sp. n.

♂.—Length about 5 mm.

Black, with very large strong punctures; face, pleura, &c. with scanty white hair; clypeus (except narrow apical margin) and lateral face-marks extending along eyes to

middle of front (but separated from upper part of clypeus by a slender black wedge) pale yellow; a slender and obscure broadly interrupted yellow occipital band; mandibles with a round basal yellow spot; antennæ black, with the long flagellum dark reddish beneath; mesothorax and scutellum with very large punctures, as dense as possible; thorax wholly without light markings; scutellum projecting; base of metathorax with strong grooves; tegulae black. Wings strongly dusky, the upper apical region very dark; b. n. falling a trifle short of t.-m.; submarginal cells about equal in size; second r. n. going far beyond end of second s. m. Legs black, the anterior tarsi bright ferruginous, and their tibiae red in front; middle tarsi reddish, hind ones red at apex only. Abdomen strongly punctured, but the punctures very much smaller than those on thorax; markings of abdomen bright chrome-yellow, consisting of a patch on each side of first two segments, and entire bands, successively broader, on the following four; the bands on the fourth and fifth segments are suddenly narrowed laterally; seventh segment bidentate, the teeth triangular and widely separated; venter with much white hair.

*Hab.* Gualan, Guatemala, Feb. 18, 1912 (*W. P. Cockerell*).

The armature of the seventh abdominal segment is not unlike that of *Anthidium alpinum* (Moraw.), except that the teeth are much smaller and not nearly so close together. The pulvilli are large, as is normal for *Dianthidium*. The species shows some resemblance to *Dianthidium impatiens* (Smith), but that insect has yellow mandibles, yellow markings on thorax, &c.

*Osmia erythrotricha*, sp. n.

♀.—Length about  $12\frac{1}{2}$  mm.

Black, with bright fox-red hair, pallid on the under side of head and thorax, extremely bright, becoming almost crimson-tinted, on abdomen above; ventral scopa bright ferruginous; mandibles broad, quadridentate; head and thorax strongly and closely punctured; tegulae shining black, with few small punctures. Wings very dark, reddish fuliginous.

*Hab.* Guatemala (*Juan Rodriguez*).

Among the American species this is allied to *O. azteca*, Cresson, which is smaller and has a yellow scopa. The extraordinary thing is that *O. erythrotricha* looks exactly like *O. pseudoaurulenta*, Dours, which I have from Tangier. I should hardly know how to separate them, but that the African insect has red tegulae, a less hairy face, much less

massive mandibles, and considerably shorter marginal and second submarginal cells. *O. pseudaurulenta* nests in snail-shells; does the Guatemalan species do the same?

*Perdita tropicalis*, sp. n.

♂.—Length about  $4\frac{1}{2}$  mm.

Head and thorax moderately shining, rather dark green, the metathorax varying to quite blue; hair of head and thorax white, long and rather abundant, the mesothorax quite hairy; head very broad, facial quadrangle broader than long, cheeks unarmed; clypeus broad and low, produced at sides, pale yellow except the broad upper margin, the upper limit of the yellow irregular; labrum pale yellow, as also the long mandibles except their broad rufous apices; lateral face-marks L-shaped, in the lower corners of the face; no supraclypeal or dog-ear marks; antennæ dark above, pale yellowish below; thorax without light markings; scutellum with a curious purplish-black tint; tegulae hyaline, with a pale yellow spot. Wings hyaline, iridescent, the nervures and margin of stigma fuscous; marginal cell rather long. Legs pale yellowish testaceous, with long hairs; anterior and middle femora behind and hind ones on both sides with a large dark brown cloud; hind tibiae with a brown suffusion. Abdomen shining, warm yellowish ochreous, the segments with dark fuscous subapical bands, which turn upwards at sides; first segment nearly all dark; venter reddish, without markings.

*Hab.* Gualan, Guatemala, Feb. 15, 1912 (*W. P. Cockerell*). Three collected from yellow flowers of a tree.

In my key to *Perdita* (Proc. Phil. Acad. 1896) this runs to 71, but is not close to either of the species there indicated, nor to the later-described species (*P. rhodura*, *P. mutzeliarum*), which also fall in this vicinity. In the face-markings, but not otherwise, there is a certain resemblance to *P. callicerata*. The species is as isolated as its geographical position would lead us to expect, although it presents no very striking features. The maxillary palpi are six-jointed, the first joint large; the labial palpi have the first joint about five times as long as the second.

*Pliloglossa mayarum*, sp. n.

♀.—Agreeing with *P. mexicana* (Cress.), except as follows:—Abdomen shining olive-green, first segment with abundant long pale fulvous hair, except at sides, where it is dense and creamy white, but on the upper part of sides, at



junction of dorsal and ventral surfaces, largely stained with sooty; segments 2 to 4 have broad apical bands covered with appressed golden hair; the second and third segments, anterior to the bands, have thin appressed golden hair, not concealing the surface, but at extreme sides the hair is black, with white hair just below this on sides of venter; the fourth segment, except apically, has appressed black hair, but with golden hairs intermixed, especially in middle; the fifth and apex have strongly plumose sooty-grey hair; the hind legs have all the hair on inner side bright copper-red; on outer side of hind tibiae the hair is posteriorly fuscous, anteriorly brownish white; labrum entirely clear red, strongly longitudinally sulcate in middle, the sides of the sulcus raised into prominent lips (the labrum of *mexicana* is not sulcate). The tegulae are light apricot-colour; hair of thorax above dense and very bright fulvous, tipped with fuscous; hair of upper part of pleura largely blackened. Wings strongly reddish.

*Hab.* Quirigua, Guatemala (*W. P. Cockerell*, 420).

*Anthidium rodriguezi*, sp. n.

♂.—Length about 20 mm.; anterior wing 13.

Black, with the mandibles except at apex, wedge-shaped lateral face-marks between clypeus and eyes, approximately the lower half of clypeus (the margin of the yellow W-shaped), the dorsal surface of scutellum, and the axillae, all pale chrome-yellow; outer side of all the basitarsi, and large apical patch on middle tibiae, pale yellow; abdomen black without markings; hair of head and thorax white, tinged with ochreous on face, vertex, and mesothorax; mesothorax with two very large discal patches of dark fuscous hair, almost united about middle; ocellar region with fuscous hairs; mandibles with two large teeth and three little ones; clypeus closely and finely punctured; antennae entirely dark, not long; mesothorax strongly and densely punctured, the middle of disc shining, with the punctures sparser; scutellum with the edge projecting, emarginate in middle; tegulae black, with small punctures. Wings fuliginous, the colour somewhat dilute; upper part of marginal cell greatly darkened; b. n. going far basad of t. m.; second s. m. longer than first, receiving first r. n. very near its base, and second r. n. an equal distance beyond its apex; anterior legs with a dense fringe of shining white hair behind, especially on basitarsi; middle femora and tibiae thickened, the tibiae and tarsi with a long fringe of white hair behind; hind tibiae with a long wedge-shaped

patch of dense white tomentum on the apical part posteriorly; hind basitarsi with a fringe of white hair on both sides; small joints of hind tarsi with some short red hair on inner side. Abdomen rather narrow, smooth and shining, strongly but not very densely punctured, without hair-bands, but segments 4 and 5 have a subapical fringe of scattered pale hairs, appearing more or less as bands in some lights; venter, especially at sides, with long, shining, white hair; apex broadly truncate, fringed with white hair, and tridentate, with a slender median tooth, and a larger one at each lateral corner; on the ventral surface, in front of each lateral apical tooth, is a large hook-like tooth. No distinct pulvilli.

*Hab.* Guatemala (*Juan Rodriguez*).

Mr. Rodriguez kindly gave a specimen to my wife when she visited him in Guatemala City. This is a most remarkable species, and when I first saw it I took it for a large Asilid fly of the *Laphria* type. I do not know any species to which it is closely related, but the armature of the seventh abdominal segment is not unlike that of *A. manicatum* (L.). The sixth segment, however, is simple, without lateral spines.

*Colletes motaguensis*, sp. n.

♀.—Length about 11 mm.

Black; abdomen rather narrow; hair of head and thorax greyish white and black, with the faintest creamy tint on face, but nowhere ochreous or fulvous; head broad; clypeus shining, with very dense and strong punctures running into striae, lower margin undulate in middle; labrum with a long, almost linear, central pit, and a groove on each side of the pit-bearing eminence; malar space rather short, but not twice as broad as long; sculpture of vertex fine and indistinct, but the inner orbital raised line leaves the eye on the vertex, and continues halfway toward the lateral ocellus; antennae short, the flagellum ferruginous beneath except at base; hair of face and cheeks pale, except a few dark hairs at sides of face below level of antennae; vertex with a moderate amount of long black hair; mesothorax strongly and densely punctured, sparsely on posterior middle; scutellum smooth anteriorly, but the greater part strongly punctured; pitted transverse band on metathorax very narrow; prothoracic spines sharp and distinct; hair of mesothorax mixed black and greyish white, of scutellio-mesothoracic suture all greyish white, forming a band, of scutellum all black, but of postscutellum nearly all greyish

white, of sides of metathorax black above and white below, of greater part of pleura black, but on ventral surface of thorax long, dense and white; tubercles fringed with white hair; tegulae shining dark piceous. Wings moderately dusky (greyish) throughout; stigma and nervures piceous; second s.m. very broad, receiving first r. n. about middle. Legs normal, with largely black hair; hind femora with a large pale scopa, full of cream-coloured pollen in the type specimen. Abdomen smooth and shining, without distinct punctures, the apical segments finely roughened; hind margins of segments with narrow white hair-bands, that on first failing in middle; apical part of fourth and fifth segments especially, before the band, with coarse black hairs; sixth segment with fine greyish hair, and with black bristles at sides.

*Hab.* Quirigua, Guatemala (*W. P. Cockerell*).

Related to *C. nautleus*, Ckll., but that has entirely black antennæ, well-punctured abdomen, &c. Also related to *C. senilis*, Sm., but that has clear wings, hair of face pale fulvous, &c.

*Colletes antiquensis*, sp. n.

♀.—Similar to *C. motaguensis*, but conspicuously more robust, and the shining, extremely minutely punctured abdomen is wholly without hair-bands; other differences are as follows: central pit of labrum broader; antennæ longer, flagellum black; long hair of face with a good deal of black intermixed, and a little black on lower part of cheeks; hair of thorax above more abundant, no pale band along hind margin of mesothorax; hair of scutellum and postscutellum both black; metathorax with more black hair; hair of pleura all black, except a little on lower part posteriorly; hair on thorax beneath not conspicuously pale; tegulae punctured; hair of legs practically all black or sooty, except that on inner side of front tarsi, which is pale orange; first abdominal segment with long black hair.

*Hab.* Antigua, Guatemala (*W. P. Cockerell*).

Differs from *C. niger*, Swenk, by the partly grey hair, striate malar space, piceous spurs, &c. The anterior coxæ are without spines. The prothoracic spines are small, wholly hidden by the long hair. The second joint of hind tarsi is large and triangular.

*Prosopis gualanica*, sp. n.

♂.—Length about 7 mm.

Black, with lemon-yellow markings; marginal cell and

beyond strongly infuscated; first r. n. meeting first t.-c.; scutellum and axillæ yellow; abdomen with continuous white hair-bands, very narrow on first, broad and conspicuous on second segment, hardly at all developed on the others, which have narrow brownish tegumentary margins. Very close to *P. maculipennis*, Smith, differing by the colour of the tibiæ, the thick anterior tibiæ black behind except at base and extreme apex, middle tibiæ black with a yellow basal spot (larger on inner size), hind tibiæ with about the basal two-fifths yellow. Also related to *P. mexicana*, Cress., but separated by the dark apex of wings, the much longer second submarginal cell, the dark middle tibiæ, and the white hair-bands on abdomen. The shape of the face and the face-markings agree with *mexicana*, but the mandibles are dark, not yellow as in *mexicana*. The sides of the clypeus are not so distinctly margined with black as in *maculipennis*. Among the South American species it is close to *P. paulistana*, Schrottky, but it differs especially in the basal area of the metathorax, which has a median enclosure, with four or five ridges, and on each side of this an enclosure with three or four oblique ridges; it also differs by the dark middle tibiæ, and the middle of the first abdominal segment with very large well-separated punctures (the second segment also has large punctures, but those of the third are very minute). The apical (lower) part of the metathorax is ferruginous.

*Hab.* Gualan, Guatemala, Feb. 18, 1912 (*W. P. Cockerell*).

*Prosopis quadratifera*, sp. n.

♂.—Length 4 mm.

Black, with lemon-yellow markings; face narrow, broadening above; mandibles, labrum, clypeus, large squarish supraclypeal mark, and lateral face-marks all yellow; the lateral marks fill space between clypeus and supraclypeal mark and eye, and go upwards as a narrow band along orbits to end in a point a little above level of middle of front; scape short and thick, yellow with a dark patch behind; flagellum long, submoniliform, dark coffee-brown, paler beneath; upper part of head and mesothorax extremely closely and finely punctured; scutellum and axillæ entirely dark; a very slender line on prothorax and greater part of tubercles yellow; pleura dull, finely and sparsely punctured; area of metathorax feebly ridged at base, its posterior margin very strongly defined, **W**-like, the median angle of the **W** forming two sides of a square apical area; tegulæ light ferruginous. Wings clear hyaline,



iridescent; the recurrent nervures joining the transverso-cubitals; second s.m. higher than broad (long). Femora black with the extreme apex ferruginous; anterior tibiae orange with a small dark bar on outer side; middle and hind tibiae rather broadly light yellow at base and narrowly ferruginous at apex; tarsi light ferruginous. Abdomen black, not hairy, with a sericeous impunctate surface; apex of venter light ferruginous.

*Hab.* Gualan, Guatemala (*W. P. Cockerell*, 9).

In my table in 'Entomologist,' 1898, this runs straight to *P. modesta*. In Lovell's table in 'Psyche,' 1910, it runs to *P. zizie*. In Metz's (1911) table it runs out at 10, because the lateral face-marks extend far above antennal sockets and are very narrow, and scape is all yellow in front. The face-marks are not like any of Metz's figures. In Schrottky's Brazilian table it runs to *P. amazonica*, Grib., but differs by the entirely black dorsal surface of abdomen, &c. The species is best distinguished by the little square apical enclosure on the metathorax.

*Mesoplia azurea guatemalensis*, subsp. n.

♀.—Tegument of head and thorax black, without any bluish tint; first three antennal joints bright chestnut-red, rest of flagellum black, dark reddish beneath; labrum rugulose, nude, hairy only at lateral margins, the hair creamy white; sides of face covered with silver-white hair, not at all yellow; eyes dark purplish; posterior orbital margins with a band of silver-white hair; tubercles and tegulae bright ferruginous; mesothorax little hairy, with close fine punctures anteriorly, the posterior disc with excessively minute punctures and scattered larger ones; anterior margin of mesothorax with hair which is pale in the middle, seal-brown at sides; scutellum strongly bigibbous. Abdomen very brilliant blue, without hair-spots. Legs red, middle tibial spur with two long branches, of which the shorter and thicker is obscurely trifid at end and has two little spines on inner side.

*Hab.* Gualan, Guatemala, Feb. 23, 1912 (*W. P. Cockerell*, 40).

This seems to be a distinguishable race of *M. azurea*, Lep., described from the Island of Guadaloupe. It differs from *Mesoplia pilicrus* (*Melissa pilicrus*, Friese) by the bigibbous scutellum, unicolorous dorsal surface of abdomen, &c.; from *Mesoplia imperialis* (*Melissa imperialis*, Ashm.) by the pre-vaillingly white hair of head and thorax, red legs, &c.; from *Mesoplia insignis* (*Melissa insignis*, Sm.) by the white hair covering sides of face, the absence of black hair on labrum,

&c. ; from *Mesoplia regalis* (*Melissa regalis*, Sm.) by the lack of green on head and thorax, the red scape, &c. ; from *Mesoplia decorata* (*Melissa decorata*, Sm.) by the blue (not green) abdomen, minuteness of the spines on thicker branch of middle spur, pure white hair at sides of face, &c. The venation agrees with that of *M. decorata*. I restore the generic name *Mesoplia*, Lep. (type *azurea*), which seems to have been set aside by Smith without any adequate reason. The species are rather "critical," owing to the fact that they are not only closely allied,\* but it is difficult to secure sufficient material for examination.

*Centris inermis gualanensis*, subsp. n.

♀.—Length about 17 or 18 mm.

Only the hind legs with very much red ; anterior tibiae in front black with a yellow streak ; a small triangular supraclypeal mark ; vertex with a broad band of brown-black hair ; labrum yellow with a dark apical spot ; hair of thorax above very bright orange-fulvous, not tipped with fuscous ; wings very dark ; a large blue-green patch on fourth abdominal segment.

♂.—Face-markings bright lemon-yellow ; supraclypeal mark large ; scape yellow in front (with only a small pale stripe in female) ; labrum entirely yellow ; all the femora largely black ; second abdominal segment with a broadly interrupted bright yellow band, widening laterally.

*Hab.* Gualan, Guatemala, Feb. 22-23, 1912 (*W. P. Cockerell*, 40). The type is a female of this lot. A female was also taken at Quirigua, Feb. 20, 1912, on a bank (*W. P. Cockerell*). Superficially this looks like *C. bimaculata* or *C. proxima*.

POSTSCRIPT.—Captain John Donnell Smith has very kindly identified several of the plants, the flowers of which were visited by the bees described above, as follows:—

*Vernonia aschenborniana*, Schauer. Visited by *Agapostemon nasutus gualanicus*.

*Ipomoea sidifolia*, Choisy. Visited by *Ceratina amabilis rhodochrysea*.

*Iresine paniculata* (L.), O. K. Visited by *Prosopis quadratifera*.

*Cordia alba*, Roem. et Schult. Visited by *Perdita tropicalis*.

*Calopogonium cæruleum*, Desv. Visited by *Mesoplia azurea guatemalensis* and *Centris inermis gualanensis*.

LXIII.—*A Review of South-African Land-Mollusca belonging to the Family Zonitidae.*—Part II. By Lt.-Colonel H. H. GODWIN-AUSTEN, F.R.S. &c.

[Plates XII.-XVII.]

IN the first part of this contribution, January 1912, p. 127, under species of *Kerkophorus*: it has been pointed out to me by Mr. H. C. Burnup that the locality assigned to *inunctus* and *poeppigi*, "Alexandra Junction, Maritzburg," is misleading. I was under the impression that the two places were not far apart. What Mr. Burnup writes clears this up, and I quote it in full:—

"*Poeppigi* may certainly have been collected at both Alexandra Junction and at Maritzburg, but it seems most unlikely that *inunctus* should be found so far from the coast as at Maritzburg. The alternative reading, and in the case of *inunctus* the more likely (since you refer to *one* animal, the type), is that Alexandra Junction is at or near Maritzburg. This is quite wrong and the difference in climate, with its vegetation, is considerable, Alexandra Junction being on the coast a little above sea-level, and Maritzburg inland at an elevation of over 2000 feet, with hills around, which would fall into the same locality, rising to 1500 feet further. Maritzburg, in a direct line, is about 40 miles N.W. from Durban, and Alexandra Junction is nearly as far S.W. from Durban. Since giving you the locality the name has been changed from Alexandra Junction to Kelso Junction."

WITH regard to coloration of the suture occurring in specimens of *P. hudsoniae*, mentioned in the first part of this paper, p. 129: Mr. H. C. Burnup, writing since its publication, agrees with me it is not a shell-character, and he attributes to it another origin, which I think is a very likely one and worth putting on record; he says:—"My experience teaches me that a similar *feature*, develops in other genera besides Peltatinæ through a fracture occurring in the liver (perhaps a small fragment being left in the apex) while withdrawing the animal from the shell. A blood-like fluid oozes from the torn liver, and capillary attraction draws it into the almost margined suture, where, unless the shell is carefully syringed, it settles, showing through the transparent shell as a rufous sutural band." In illustration Mr. Burnup sends

me two specimens of *Euonyma lanceolata*, Pfr., which show this even far more distinctly than in the specimens of *P. hudsoniae* referred to by me.

### Species of the Genus KERKOPHORUS.

The most striking feature in the animal of this genus is the great elongation of the lobe above the mucous pore, forming quite a tail-like extension of the extremity of the foot. Major Connolly has given me a copy of his original description made from the first example he saw alive of *Microkerkus symmetricus*, Craven, which will be described in the next portion of this paper. This field-note is of considerable interest and I quote it *in extenso*:—

“Tail as long as fore part of body, indented for  $\frac{1}{8}$  inch from the tip with a peculiar cleft or fissure, from the upper end of which grows a small, black, fleshy horn, *which can be withdrawn or slightly protruded at will.*” (The italics are mine.)

Now in this species the lobe or horn is far smaller than in *K. inunctus* and the species described below, and yet it was observed to be retractile; how much more apparent this power of enlargement by the animal and its sensibility would be in the latter species, where the horn has reached its maximum development.

In the Indian genera of the Zonitidæ, such as *Ariophanta*, *Macrochlamys*, *Austenia*, *Girasia*, &c., the lobe, although showing considerable diversity in shape and dimensions, would not be described as decidedly retractile; its size and form is more dependent on atmospheric conditions.

This leads me to refer to a paper which was published in the ‘Proceedings of the Malacological Society,’ vol. i. pt. 6, July 1895, on *Martensia mozambicensis*, Pfr. The species had been recently collected by Dr. J. W. Gregory when on his interesting expedition in Eastern Africa during 1893. I was indebted to Mr. Edgar R. Smith for the two specimens I dissected and described.

This African land-shell has also a peculiarly long horn above the mucous pore, *vide l. c.* pl. xix. figs. 1 & 1a, drawn from a spirit-specimen and therefore very much contracted to what it must be in the living state; muscular rings on the horn point to its extensibility. The shell of *Martensia mozambicensis*, Pfr., differs in every way from the globose, few-whorled, and comparatively thin shells of *Peltatus* and allied genera, being solid or more helicoid in form. Several species are recorded by Prof. E. von Martens in the Monatsb. der könig. preuss. Akad. Wiss. Berlin,



April 1878; one species *radiolata*, v. Mart., a very globose banded shell, he made the type of his genus *Zingis*. I gave reasons (*l. c.* p. 283) why these would be better included in Sempér's genus *Martensia*, type *morumbicensis*, which had priority by many years.

When we look at the portion of the generative organs (*l. c.* pl. xix. fig. 1 *b*) and compare them with those of *Peltatus* and allied genera, there is a peculiarly close resemblance in type—particularly observable in the form of the spermatheca, an expanded thin-walled sac on the end of a long stalk-like tube; the penis only differing in the absence of a cœcum near the retractor muscle; the grooving on the side of the foot; the division of the sole; while the radula is of precisely the same type. I may even go a step further, and on these grounds, to say nothing of contiguity of habitat—in spite of difference in shell-character and that the formation of shell-lobes has not commenced,—suggest that the genus *Martensia* can be better placed in the subfamily Peltatinae than in any other.

*Kerkophorus inunctus*, M. & P.

(Pl. III.\* figs. 1, 1 *a*, animal; Pl. XII. figs. 2–2 *e*.)

*Locality.* Alexandra Junction (No. 3278) †.

Shell not umbilicate, very globose; sculpture very microscopic longitudinal striation, papillate and somewhat irregular; colour pale vinous ochre, with a very narrow indistinct peripheral band pale chestnut in colour; spire low, apex rounded; suture well defined; whorls 4, increasing regularly and rapidly; aperture widely ovate, oblique; peristome thin, rounded above and sinuate on side; columellar region vertical, rounded below, weak, slightly reflected near the umbilicus.

Size: major diameter 17·5, minor 14·5; alt. axis 4·75 mm.

Animal about 40 mm. long in spirit, pale-coloured, with no special markings, the scattered spotting on the visceral sac shows through the shell. Foot divided below; peripodial margin narrow, with the usual two grooves above, from which well-marked widely separated furrows extend obliquely upwards.

The hinder part of the foot above is rounded, not keeled; the lobe above the linear mucous pore is large and rises considerably, ending in a long overhanging sharp point.

\* Plates I.–VII. were given with Part I. of this paper ('Annals,' Jan. 1912).

† The numbers refer to specimens received from those who have assisted me in this work; they may prove useful for future reference to the spirit-specimens and mounted objects.

The right shell-lobe (Pl. III. fig. 1) is large and broad, the left (fig. 1 *a*) quadrate; the two, when extended in life, must cover the greater portion of the shell. The dorsal lobes are well developed, and the left one is in two parts, the posterior portion being small. The visceral sac is the same colour throughout, sparsely mottled with small black spots, over the kidney there are a number close together forming a dark band, seen through the shell.

The generative organs (Pl. XII. figs. 2, 2 *a*) are similar to those of *phædimus*, M. & P., with this exception, the vestibule is large, globose, solid, having thick walls, externally with a rough warty surface, very conspicuous as shown in fig. 2; when this is cut through and opened out as in fig. 2 *a*, on the walls of the internal surface some four strong, muscular, pillar-like folds are seen, not observed in any other South African species I have as yet examined. The free oviduct (ovitheca?) is intensely black, in strong contrast to the rest of the generative organs. The penis has an accessory gland near the retractor muscle: the epiphallus is very short, as in No. 3379 *phædimus* (Pl. V. fig. 3) and *poepiggi*?, and the flagellum very long. The spermatheca is a large pear-shaped sac on a long solid duct. The formula of the radula (Pl. XII. figs. 2 *c-e*) is

60 . 1 . 15 . 1 . 15 . 1 . 60, or 76 . 1 . 76.

The centre and admedian teeth are on large plates, the latter with a cusp on the outside. The 16th tooth is transitional with no cusp. The succeeding marginals are curved and aculeate up to about the 65th tooth, when a slight notch appears low down below the point on the outer side, rising higher and higher and at the same time larger; the outermost marginals (fig. 2 *e*) are unevenly bicuspid. The aculeate form of the teeth (fig. 2 *d*) in this species separates it well from its congeners. The jaw (fig. 2 *b*) is moderately curved, with a central projection on the cutting-edge.

Another species was received as *Helicarion phædimus*, Melv. & Pons.; the specimens were beautifully preserved. Mr. H. C. Burnup writes from Maritzburg, Natal, 21st March, 1908:—

“There is no doubt about this species being *Helicarion phædimus*, M. & P.; we are quite familiar with the form, but as there are so many of the old species unknown, there is always the possibility of the newer species having been described before. Besides I do not know if it has been satisfactorily ascertained that any of our so-called *Helicarions* really belong to that genus.”

The species which have given me most trouble when

working at this group of molluscs are *corneus*, Pfr., *poeyippi*, Pfr., *natalensis*, Krs., *inunctus*, M. & P., and *phædimus*, M. & P., three of the oldest and two of the latest described; and, as Burnup very accurately writes, "the difficulty of recognizing the earlier described species is a terrible barrier to completion."

I asked him what is *corneus*? to which he replies:—

"It seems reasonable to suppose that, however many rare shells they may have found, the early discoverers would find most of the commonest ones. *Phædimus*, M. & P., is very plentiful at Port Natal, i. e. Durban, as elsewhere in the province of Natal. Can you realize the possibility of *corneus* being *phædimus*? According to Pfeiffer's dimensions, *corneus* is relatively one of the lowest shells of the group, *phædimus* is one of the lowest of those known to me. That the typical *phædimus* from the mid lands is smaller than what I take to be the same species from the coast need not be considered, there are so many instances of the coast shells being larger than those from the mid and high lands. That *phædimus* from the mid lands almost invariably has a suprapерipheral band, while the same (?) species from the coast only sometimes has, must be an insignificant point." To confirm this Mr. Burnup sends me four specimens of *phædimus* from Maritzburg, all banded; three unbanded with one banded from Durban: they present no difference save in size. The shell of the animal dissected and described by me, supplied by Ponsonby from Maritzburg, agrees exactly.

*Kerkophorus phædimus*, M. & P. (Pl. V. fig. 3;  
Pl. XIII. figs. 1-10.)

Maritzburg.

Animal (figs. 1, 2) very pale in colour, with a long, narrow, keeled foot indistinctly divided, and having a very long arched lobe (fig. 3) above the mucous pore. A broad, large, pointed right shell-lobe (*rs**l*) and a broad left shell-lobe (*ls**l*); they unite behind at the keel of the foot, and in life must cover the greater part of the shell. Right dorsal lobe (*rd**l*) small; the left entire, covering the neck. Peripodial grooves very indistinct, showing better on the anterior margin. On the visceral sac (fig. 5, *rs*) near the rectum (*r*) and heart (*h*) are white mottlings, which extend and increase to a band of that colour towards the apical whorls, the rest of which is black.

*Generative organs* (Pl. V. fig. 3).—The penis has a long, tapering, rather twisted flagellum, the vas deferens joining near the base. The epiphallus is short. Adjacent to the attachment of the retractor muscle there is a

fairly large free accessory gland (*ac.gld*). The spermatheca (Pl. XIII. figs. 7-9, *sp*) is an elongate thin sac at the distal end of a thick strong tube. The free oviduct just above the base of the spermatheca is a very dark pigmented globose sac (*ot*) (ovitheca?), with strong smooth walls into which the oviduct leads. The shaft of the penis is bent in S-form, so that if it were extended it would be of considerable length.

Radula: central tooth tricuspid, admedian with cusp on outer side, as figured in Ann. & Mag. Nat. Hist., Feb. 1908, pl. viii. fig. 1 *d*; laterals are long, beautifully curved and bicuspid; the last of the marginal teeth show pectination on the outer side. Formula is

100 . 3 . 12 . 1 . 12 . 3 . 100, or 115 . 1 . 115.

Jaw (fig. 6) moderately concave on the cutting-edge, with a small central projection.

The branchial cavity is not extensive; the pericardium and adjacent renal organ occupy a subcircular area next it, the kidney being short.

The spermatheca (fig. 9) contained a perfect spermatophore, a beautiful object. It consisted of an elongate capsule, commencing with a mass dark and pointed at one end, terminating in a long gradually narrowing ribbon, having spines set on its edge on one side only. The spines generally branching into three, with bifid points. The ribbon becomes very attenuate at the end and for some distance is spineless.

In the same individual was a spermatophore developing in the flagellum (fig. 10) and portion of the male organ near the junction of the vas deferens. The attenuated portion corresponds to the extreme free end of the flagellum, and the spines are seen in process of forming. The black portion in fig. 10 (Pl. XIII.) represents a hardened mass of spermatozoa.

The spermatophore of *Peltatus* previously described (Ann. & Mag. Nat. Hist., Feb. 1908, p. 132) was immature in process of formation; the fig. 1 *b*, pl. viii., may be compared with fig. 10, Pl. XIII., of *B. phrudinus* in a similar stage.

It was interesting thus to find many characters similar to those of *Peltatus aloicola*, M. & P.: the principal differences lying in, (*a*) the expansion of the shell-lobes into large lappets, (*b*) the great development of the lobe over the mucous gland. In (*a*) we are presented with the similar development of the animal as regards the mantle as shown in the genus *Euaustenia* of India, separating it from *Macrochlamys*, with elongate narrow shell-lobe.



*Kerkophorus vitalis*, M. & P. (Pl. III. fig. 3;  
Pl. XIV. figs. 1-1 e; Pl. XV. fig. 2.)

*Helicarion vitalis*, M. & P., Ann. & Mag. Nat. Hist. ser. 8, vol. i.  
February 1908, p. 133, pl. vii. fig. 4 (shell).

Original description:—

"*H. testa pertenui, vitrea, vivide ochracea, rimata, globoso-conica; anfractibus 4½, apice ipso obtusa, cæteris ad suturas impressis, ultimo rapide accrescente; apertura rotundo-lineari; peristomate papyraceo, tenuissimo, apud regionem umbilicarem paululum incrassato et reflexo.*

"Alt. 12, diam. 15 mill.

"*Hab.* Port Shepstone, Natal (*Burnup*).

"A very beautiful globose, transparent shell, tinted with pale ochre, which seems distinct from all the species hitherto enumerated from this region."

The animal is very pale in colour as preserved in spirit, which in some cases seems to bleach the things put in it.

The posterior part of the foot very lengthened, the lobe over the mucous gland (Pl. III. fig. 3) very long and pointed. The right shell-lobe broad and very long; the left triangular and pointed, large, on a broad base. The left dorsal lobe in two parts, the posterior one very small. The visceral sac near the mantle-margin and over the branchial cavity is quite plain; adjacent to the kidney and heart there are a few white spots. With the liver close white mottling commences, and towards the apex that portion covered externally by the shell is all white.

The generative organs (Pl. XIV. figs. 1, 1 a) compare well with those of *Kerkophorus phadimus*, M. & P., even to the closely coiled state of the penis (*vide* fig. 7, Pl. XIII.). The spermatophore (Pl. XV. fig. 2) was secured in a most perfect state, and is of the same type as in that species, differing in small points of detail. It has 27 branching spines on one side and two on the other next the capsule. On Pl. XIV. fig. 1 b the form of the branches terminating in bifid points is shown.

The radula (Pl. XIV. figs. 1 d, 1 e) has more teeth in the row than any other species of these African genera yet examined by me, having a formula

126 . 1 . 12 . 1 . 126, or 139 . 1 . 139.

It is also remarkable by the admedian teeth being finely serrated on the margin, beginning with the thirteenth tooth, and this character continues to the margin.

The jaw (Pl. XIV. fig. 1c) of the specimen examined shows little sign of the central projection, and is only slightly concave on the cutting-edge.

*Kerkophorus melvilli*, sp. n. (Pl. VII. figs. 1-1 d;  
Pl. XIV. fig. 2.)

*Locality.* Equeefa, Natal (No. 14, H. C. Burnup).

Shell globosely conoid, scarcely perforate; sculpture nearly smooth, very fine, microscopic raised dots, in places showing a longitudinal arrangement; colour bright olivaceous ochre with a green tinge; spire subconoid; suture impressed; whorls 4, the last rapidly increasing; aperture ovately lunate; peristome thin, sinuate; columellar margin very weak, thin, and convex.

Size: major diameter 17·5, minor 15·0; alt. axis 8·0 mm.

The animals were well preserved, two in number; the largest was taken for examination. There is a large right shell-lobe, broad and leaf-like; the left shell-lobe also large and expanding, similar to those of *phædimus* and *inunctus*.

The animal has no markings. The foot is divided and it has a conspicuous long-pointed lobe above the large mucous gland. The ground-colour of the visceral sac is pale greenish grey, much speckled finely and evenly with small black and white spots (pepper and salt would best describe it) over the branchial cavity, kidney, and heart. The black spots become more numerous near the kidney, and coalescing form a conspicuous band; beyond this and towards the part filling the apex of the shell the white spots increase in size, somewhat quadrate in form, and then a narrow, foliated, irregular edged band. The character of the coloration is similar to that of *Kerkophorus inunctus*; in that species the apex is pale-coloured, with no white markings. The respective shells settle and separate the species: *inunctus* has a much lower spire and is finely banded.

In the generative organs the penis is closely coiled, as shown in Pl. XIII. figs. 7 & 8. The flagellum is very long and tapering; the accessory gland is long and bag-shaped, and the strong retractor muscle is given off close to the base of it. The spermatheca is very capacious, elongately pear-shaped at the head of a long duct; the walls of this were not, as is usual in other species I have examined, thick and solid, but were so thin and transparent that particles within it could be seen floating about. In the pear-shaped sac only a small portion of a spermatophore (Pl. VII. fig. 1) was found, not

sufficiently well-preserved to show the form of the spines, a detail which is so important in these African genera.

The radula (Pl. VII. figs. 1*a*–1*c*) is interesting for its similarity to that of *K. inunctus* in having quite a number of aculeate laterals; these pass towards the margin, and at about the thirty-fifth tooth from the edge into the bicuspid form, with the inner point the longest. The arrangement is about  $80 \cdot 3 \cdot 13 \cdot 1 \cdot 13 \cdot 3 \cdot 80 = 96 \cdot 1 \cdot 96$ .

The jaw has a central projection.

Of No. 14 Burnup says: "possibly the same species as No. 11."

Of No. 11: "These, I should think, will belong to the same as the largest of No. 10 and No. 14."

*Kerkophorus laevispiris*, Pfr. (Pl. XVI. figs. 1–1*b*, animal; Pl. XVII. figs. 1–4.)

*Locality.* Tongaat (H. C. Burnup); twenty specimens.

Shell thin, imperforate, globose; sculpture smooth and glossy to the eye, under high power microscopic, regular, fine longitudinal striation; colour pale sap-green when animal is removed; spire low, apex flatly conoid; suture shallow; whorls 4, regularly but rapidly increasing to the last, which is tumid and well rounded on the periphery; aperture semioval, higher than the breadth; peristome very thin; columellar margin weakly concavely rounded.

Size: major diam. 11·75; alt. axis 6 mm.

*Animal* (Pl. XVI. figs. 1–1*b*).—Before this is removed from the shell the contrast of the black and white on the visceral sac is very striking and characteristic of this species, for it shows through the thin shell (fig. 1), and it appears black beneath, with a very narrow edging of same colour next the suture of the second and third whorls, the first two apical whorls being wholly white.

The foot is divided on the sole and has a long overhanging lobe above the mucous pore. There is a peripodial margin, with two grooves above. The right shell-lobe (Pl. XVI. figs. 1 & 1*a*) is narrow, elongate, and tongue-shaped; it is given off from the side of the right dorsal lobe just below the rectum, and in life is evidently extensible for a considerable distance over the upper surface of the shell, as in many species of *Macrochlamys*. (In the specimen figured (fig. 1*a*) the lobe terminates in two points, quite an abnormal case, and one, after examining hundreds of specimens, I have never seen before.) There is a long, narrow, finely pointed left shell-lobe (Pl. XVI. fig. 1*b*), also extensible, given off from

the edge of the mantle, on the left anterior side. The left dorsal lobe is in two distinctly separate portions, the interval being just to the right of and below the left shell-lobe.

The walls of the branchial cavity are sparsely spotted with pure white, similar to the band of the same colour which, commencing at the rectum, is continuous in a posterior direction, widening considerably over the heart and kidney, and occupies quite half of the circumference of the coil of the visceral sac.

The radula (Pl. XVII. figs. 3, 3*a*) has the formula 67.3.9.1.9.3.67, or 79.1.79. The central and admedian teeth have a basal cusp on the outer side, rather distant from the mesocone; the laterals are evenly bicuspid, gradually becoming so from the tenth transition admedian tooth. The marginals are distinctly serrated below the outer cusp (fig. 3*a*, 65-79). In this character it agrees with *Peltatus hudsonice*, but it is far more defined. In the form of the basal plates, as well as in the form of the teeth, this radula does not recall those we know in the genera of Indian Zonitidæ.

The jaw (Pl. XVII. fig. 4) is well arched, with a central projection on a deep concave cutting-edge.

In the generative organs (Pl. XVII. figs. 1, 1*a*) the penis has an accessory gland, globose and sessile, situated on the epiphallus about one-third its length from the retractor muscle. The flagellum is short. The spermatheca (*sp*) is a globose sac at the end of a strong, thick, and long duct. It contained a very perfect spermatophore (Pl. XVII. fig. 1), protruding in part, having ruptured the wall of the sac. In fig. 2 this is much enlarged, to show its remarkable detail and the beautiful form of the spiny setting. There are some thirty-five tufts following one side of the flume, made up of elongate branches, each side branch bifid at the extreme point; where perfect they are arranged in pairs like the antlers of a stag. The form the spines assume varies in an interesting way in different species of the genus. The capsule is very long, and this may be termed the anterior part of this organ, the flume the posterior. About the middle (see right-hand side of fig. 2) it may be seen that it is joined by a much thinner tube (see Pl. XVII. fig. 2*b*, *w*). This is of very considerable length, and when a spermatophore is removed from the sac it is resting in, the whip-like end is found extending down the duct and has to be drawn out of it.



## Species of the Genus MICROKERKUS.

*Microkerkus symmetricus*, Craven. (Pl. I. figs. 2, 2 a, animal; Pl. III. fig. 4.)

*Locality.* Pretoria (No. 4).

Shell globosely conoid, thin, rimate; sculpture very indistinct longitudinal streaking, with well-seen lines of transverse growth; colour ochraceous, with a yellow tint; spire conic, apex blunt; suture shallow; whorls 4, somewhat rapidly increasing, and tumid, the last rounded on the periphery; aperture widely lunate; peristome very thin; columellar margin not thickened, subvertical, a slight reflection near the umbilical region.

Size: major diam. 14.6, minor diam. 12.4; alt. axis 7.5 mm.

Ponsonby and Connolly both agree that this species, No. 4, and that provisionally named *concinus* from Boksburg, near Johannesburg, are the same.

In No. 4 tube I found two species, with locality Pretoria; in two of the specimens the animal was not removed from the shell, and the largest I dissected.

The remaining three specimens must be *Zingis natalensis*, as given in the list of specimens sent me by Mr. Burnup; but what the shell is like it is impossible to say, or to which of the two species his following notes apply:—

“This has been identified as *Zingis natalensis*, Pfr., but local collectors doubt the accuracy of the determination, and I think Mr. Ponsonby now shares the doubt. As the true *Zingis natalensis*, Pir., is a common shell at Port Elizabeth, its anatomy is probably known, but in any case one of Mr. Ponsonby’s correspondents is likely soon to supply you with examples.”

*Animal.*—Lobe over the mucous pore (Pl. III. fig. 4) at the extremity of the foot only moderately long, the right shell-lobe (Pl. I. fig. 2) long and very narrow, the left shell-lobe (fig. 2 a) triangular, small. The left dorsal in two parts, the posterior the largest. The visceral sac on the anterior part pale-coloured, with short narrow white streaks extending as far as the kidney; distant rather large spotting follows and continues to the apex. Liver a pale grey-brown.

The generative organs (Plate in next part), although generally like the other species of this South-African subfamily, differ in detail: the accessory organ is very close to the retractor muscle, the flagellum is shorter, and at the head of the shaft of the penis there is a sharp bend concealed somewhat by muscular tissue. The spermatheca contained a

spermatophore, perfectly formed. The spines are all on one side, closely set, branching, and elongate and tapering, of the type of *leucospira*; the flume branches into two, one branch being whip-like.

The radula: central and admedian teeth as in the subfamily, the outermost marginals with two or three serrations below the outer upper cusp.

Formula: 48 . 3 . 11 . 1 . 11 . 3 . 48, or 62 . 1 . 62.

Jaw much arched, with a central projection.

*Microkerkus pondoensis*, sp. n. (Pl. IV. figs. 2, 2 a;  
Pl. XIV. figs. 3, 3 a, animal.)

*Locality.* Pondoland (No. 47).

Shell unfortunately much injured when extracting the animal; sculpture quite regular longitudinal striation; colour yellow ochraceous, the first two whorls white as in *leucospira*; spire flatly conoid, apex bluntly rounded; suture impressed; whorls 4; aperture broken; peristome broken; columellar margin broken.

Size: major diam. 12.25, minor?; alt. axis? mm.

The animal differs from all the species of this group I have as yet seen by having no markings of any sort on the visceral sac, which is milky white throughout. The lobe over the mucous pore smaller than in other species; but the specimen examined is very much contracted in the spirit, so conclusions of this kind are not of great value, and it is to be hoped collectors in the future will make descriptions from the animals when taken alive.

The peripodial margin is broad and closely fringed, as it were.

Foot divided. Right shell-lobe and left shell-lobe small.

The generative organs (Pl. IV. fig. 2) only differ from those of allied species in small particulars. The shaft of the penis is long, the epiphallus very long and much convoluted near the accessory gland, which appears caught up in the coil. The flagellum has a longish caecum attached to it (*f*). This is a variation in this particular part noticed also in *K. burnupi*, sp. n., No. 15 (Pl. II.), connected with a corresponding variation in the form of the attenuate end of the spermatophore. This bifurcation also occurs in *Kerkophorus leucospira* (*vide* Pl. XVII. fig. 1 a).

"Sent to the Cape Town Museum by Miss Pegler from Kentani, near Pondoland. We have begged her to send more either live or properly drowned. The shell appears to be ? *Helicarion leucospira*, Pir., or *pellicula*, Fér.; but *leuco-*

*spira* is only distinguished by its white spire, which cannot be seen while the animal is inside the present examples. No one out here knows what *pellicula* is; it may be the young of two or three spp., such as *autalensis*, Krs., *pholidinus*, M. & P., *vitalis*, M. & P., &c., or may be = *leucospira*." (M. Connolly.)

I have very recently had an opportunity of carefully examining with Major M. Connolly No. 15, sp. n.? (*vide* p. 128, part 1), from Maritzburg, which I had named provisionally *burnupi*. No. 15 agrees best with specimens in the Natural History Museum named *pellicula*, Fér. There are, however, in the same box two distinct species, one represented by two examples from Natal, the other by one shell from Delagoa Bay. *K. burnupi* comes nearest to the Natal specimens. On looking at Ferrussac's figures of *pellicula* (Desh., Hist. Nat. Moll. pl. ix. A, 1851), they represent a form with a high spire, higher than in *K. burnupi*, the description of which must now come in the third part.

*Microkerkus chrysoprasinus*, M. & P.

*Locality.* Thaba N'ehu, O.R.C. (Major M. Connolly); three specimens in spirit (No. 72).

Shell very minutely perforate, globosely conoid; sculpture smooth; colour rich ochre, paler at apex, second species streaked transversely with pale narrow bands; spire conic, moderately high, apex blunt; suture impressed; whorls 4, first three increasing regularly, the last much expanded; aperture broadly lunate and broad as high, oblique; peristome thin, slightly sinuated; columellar margin weak, thin, and joining the thin callus on the side.

Size: major diam. 11.6, minor 10.0; alt. axis 6.8 mm.

*Animal.*—The visceral sac is wholly white, towards the apex becoming ochraceous; there is a thin dark streak, with some white spots parallel to and near the mantle-zone and some white spotting near the region of the heart, with a faint narrow grey band near the kidney. The head and extremity of the foot greyish in one specimen, in the other two all of the same pale ochraceous tint. One of the largest specimens dissected and drawn has a fairly long narrow right shell-lobe and a small, triangular, pointed left shell-lobe. The mucous gland at extremity of foot is covered with a small pointed lobe.

The generative organs are very similar to those of *symetricus* in having a small accessory gland globose and sessile,

a long epiphallus, and a very long and tapering flagellum. The sheath of the penis is bent into S-form. Spermatheca a globose sac on a long stalk; it contained only the capsule of a spermatophore, all trace of the rest had disappeared.

The radula was very perfect. It is very characteristic, not exactly like any other I have seen. The central and admedian teeth rather more elongate than usual, the latter with a single basal cusp on the outer side; the eleventh tooth rises higher and the plate is much narrower at the fifteenth; the teeth are long, narrow, and nearly evenly bicuspid, becoming very small and still narrower on the margin.

Formula: 56 . 10 . 1 . 10 . 56, or 66 . 1 . 66.

Jaw with a central projection.

Will be figured in the next part.

#### ANDRARION, gen. nov.

Shell small, flattened, of few whorls, the apical close-wound and rapidly increasing.

Animal (extremity of foot not seen) has a broad, short, right shell-lobe and a small triangular left shell-lobe. Generative organs not yet seen. Radula with inner marginal teeth bicuspid, with a serrated outer edge, the outer tricuspid.

#### *Andrarion pumilio*, M. & P. (Pl. XVI. figs. 3-3 b.)

*Helicarion pumilio*, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 8, vol. iv., Dec. 1909, p. 490, pl. viii. fig. 11.

Original description:—

“*H. testa parva, planulata, succineata, tenui, breviter obscure perforata; anfractibus 3, quorum apicalis submamillatus, nitidus, suturis impressis, ultimo anfractu effuso; apertura late lunari: peristomate tenuissimo, marginem super columellarem obscurissime reflexo.*”

“Alt. 4, diam. 7 mm.

“*Hab.* Zoutpansberg, Transvaal.

“At once distinguished from all South-African congeners yet known to us by its small size. The anatomical details of this species, as well as *russofulgens*, are at present unknown, but the shells of both seem distinct enough to warrant description.”

Two specimens were received through Mr. Ponsonby: they are not so large as the type shell in the Natural History Museum. The animal was not in a good state, so very little



of the internal anatomy could be made out. There is a broad, short right shell-lobe (Pl. XVI. fig. 3) and a triangular, small left shell-lobe, and a black narrow band bordered the mantle-edge.

The radula (Pl. XVI. fig. 3*b*) was secured. The central admedian teeth are of usual form; the first marginals are nearly evenly bicuspid, becoming tricuspid about the thirtieth tooth, and several have even four cusps and show a serrated edge.

The formula is 45 . 2 . 9 . 1 . 9 . 2 . 45, or 56 . 1 . 56.

Jaw with a central projection (Pl. XVI. fig. 3*a*).

Major Connolly suggested to me that these small shells were the young of *M. symmetricus*, Craven, but the serrate teeth described above are not found in that species. So far as known, *A. pumilio* differs from all the species I have as yet seen from South Africa.

## EXPLANATION OF THE PLATES.

### PLATE XII.

*Kerkophorus poeppigi*, Mke.? Pine Town, near Durban. (No. 3379.)

Fig. 1. Portion of the generative organs.  $\times 4.5$ .

Fig. 1*a*. The spermatophore complete.  $\times 12$ .

Fig. 1*b*. Whip-like end of the spermatophore.  $\times 24$ .

*Kerkophorus inunctus*, M. & P. (1899). Alexandra Junction.  
(No. 3278.)

Fig. 2. The generative organs.  $\times 4.5$ .

Fig. 2*a*. The vestibule of same opened out.  $\times 4.5$ .

Fig. 2*b*. The jaw.  $\times 12$ .

Fig. 2*c*. The central teeth of the radula.  $\times 368$ .

Fig. 2*d*. Lateral teeth at different parts of the row.  $\times 368$ .

Fig. 2*e*. The outermost laterals.

### PLATE XIII.

*Kerkophorus phædimus*, M. & P.

Fig. 1. Animal, viewed from the right upper side.

Fig. 2. Ditto, from the right side.

Fig. 3. Extremity of the foot, with long overhanging lobe (enlarged).

Fig. 4. Right side, to show the dorsal lobes; the large right shell-lobe has been destroyed (*vide* fig. 2).

Fig. 5. Animal removed from the shell, showing the rectum, branchial sac, heart, &c.

Fig. 6. Jaw.  $\times 24$ .

Fig. 7. Generative organs.  $\times 4.5$ .

Fig. 8. Penis partly unrolled.  $\times 4.5$ .

Fig. 9. Spermatheca sac, with spermatophore inside.  $\times 12$ .

Fig. 10. The flagellum, with portion of a spermatophore in course of formation.  $\times 12$ .

## PLATE XIV.

*Kerkophorus vitalis*, M. & P. Port Shepstone, Natal.

- Fig.* 1. The male organ.  $\times 4\cdot5$ .  
*Fig.* 1 *a*. The spermatheca and free oviduct, &c.  $\times 4\cdot5$ .  
*Fig.* 1 *b*. A short portion of a spermatophore, showing type of spines on side of the flume.  $\times 58$ .  
*Fig.* 1 *c*. The jaw.  $\times 12$ .  
*Fig.* 1 *d*. Thirty-eighth, thirty-ninth, and fortieth teeth of the radula.  $\times 368$ .  
*Fig.* 1 *e*. Tenth to sixteenth, showing the transition-teeth.

*Kerkophorus melvilli*, sp. n.

- Fig.* 2. The generative organs.  $\times 4\cdot5$ .

*Microkerkus pondoensis*, sp. n.

- Fig.* 3. Animal with the shell removed, viewed from the right side.  $\times 4\cdot5$ .  
*Fig.* 3 *a*. Ditto, ditto, left side, to show minute left shell-lobe.  $\times 4\cdot5$ .  
 The position of the heart and kidney also shown.

## PLATE XV.

*Kerkophorus ampliata*, M. & P. (No. 7.)

- Fig.* 1. Animal with shell removed, seen from the right side.  $\times 3\cdot4$ .  
*Fig.* 1 *a*. Ditto, part of, left side, to show shell and dorsal lobes.  $\times 3\cdot4$ .  
*Fig.* 1 *b*. Ditto, seen from above, showing position of generative organs.  $\times 4\cdot5$ .  
*Fig.* 1 *c*. Generative organs removed.  $\times 4\cdot5$ .  
*Fig.* 1 *d*. A spermatophore, complete.  $\times 18$ .

*Kerkophorus vitalis*, M. & P. Port Elizabeth.

- Fig.* 2. A spermatophore, entire.  $\times 18$ .

## PLATE XVI.

*Kerkophorus leucospira*, Pfr.

- Fig.* 1. Animal, viewed from right side.  $\times 1\cdot5$ .  
*Fig.* 1 *a*. Ditto, ditto.  $\times 4\cdot5$ .  
*Fig.* 1 *b*. Ditto, left side.  $\times 4\cdot5$ .

*Kerkophorus fuscicolor*, M. & P. Harrismith.

- Fig.* 2. Animal, mantle-margin, right side.  $\times 4\cdot5$ .  
*Fig.* 2 *a*. Ditto, ditto, left side, with branchial sac and kidney.  $\times 4\cdot5$ .  
*Fig.* 2 *b*. Extremity of the foot.  $\times 8$ .

*Andrarion pumilio*, M. & P.

- Fig.* 3. The mantle-margin detached from body of animal.  $\times 4\cdot5$ .  
*Fig.* 3 *a*. Jaw.  $\times 24$ .  
*Fig.* 3 *b*. Marginal teeth of the radula, very much enlarged.

## PLATE XVII.

*Kerkophorus leucospira*, Pfr. Tonguat.

*Fig. 1.* Part of the generative organs,  $\times 4\cdot5$ , showing the spermatheca with a spermatophore within it, the hermaphrodite duct (*hd*), albumen-gland (*alg*), oviduct (*ov*), &c.

*Fig. 1 a.* The male organ detached.  $\times 4\cdot5$ . *fl*, flagellum; *fl'*, accessory portion of flagellum.

*Fig. 2.* Spermatheca and its duct much enlarged, to show the spermatophore within it more clearly; the latter is seen protruding, the wall of the sac having been ruptured.

*Fig. 2 a.* Terminal end of the flume (*vide* left-hand side of *fig. 2*, where it is represented terminating abruptly and was indistinctly seen).

*Fig. 2 b.* Portion of flume at about the middle of its length, to show the form of the spines (also *vide* right-hand side of *fig. 2*, where a very long whip-like part (*w*) is given off and is the last part to enter the spermatheca). *m* is the membranaceous wall of the sac in section.

*Fig. 3.* Teeth of the radula at different parts of the row.  $\times 368$ .

*Fig. 3 a.* Outermost marginals, 65-79.

*Fig. 4.* Jaw.  $\times 12$ .

## LXIV.—A Revision of the Asilidæ of Australasia,

By GERTRUDE RICARDO,

[Continued from p. 488,]

*Brachyrrhopola nitidus*, Macq.

Type seen in Paris, apparently a male, from Tasmania, is no doubt a species of this genus, though not recognized as such by Macquart.

A species with reddish *abdomen* and *legs* and the *wings* clear, slightly tinged dull yellowish on the fore border, with black veins.

*Face* with bright yellow tomentum, no tubercle; moustache pale yellow. *Palpi* red. *Antennæ* reddish, the third joint with indistinct terminal spine. *Thorax* red with black markings. *Abdomen* slender, narrower at base; the first segment black, the second partly black, the others with very narrow darker segmentations. *Legs* red, fore tibiae with the curved spine, the femora not incrassate. *Wings* with the fourth posterior cell a little narrower at border, anal cell not quite closed.

The following is the original description;—

Slender, shining, testaceous. Thorax with brown stripes. Abdomen with black side stripes on the anterior segments,

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Moustache yellow. Antennæ and legs testaceous. Wings reddish.

Length 7 lines, ♂ ♀. Palpi testaceous with yellow hairs. Beard yellowish. Face with golden tomentum; moustache plain, yellow. Forehead black, with slight yellowish tomentum. Thorax testaceous, with blackish bands. Abdomen slender, testaceous, the first two segments with a longitudinal black stripe on the scales. Anterior legs with a spine.

Wings: neuration normal; the first transverse vein situated beyond the middle of discal cell.

From Tasmania.

*Brachyrrhopola ruficornis*, Macq.

Type of the genus. From Tasmania.

Mr. Froggatt records it from Mackay, Queensland.

Macquart describes it as follows:—

Black, shining. Scutellum testaceous. Abdomen with yellow bands. Antennæ and legs red. Wings with the anterior half brown. Length 3 lines, ♀?

Face with white tomentum; a stripe and a small protuberance black; moustache white. Forehead black. Antennæ: a little brown at the apex. Thorax with scanty yellow tomentum and indistinct stripes; sides with a white spot below base of wings, prolonged to and including the intermediate coxæ. Abdomen with scanty yellow tomentum. Coxæ black, the anterior half of the posterior femora and base of intermediate pair black: anterior tarsi black. Halteres yellow. Wings: the anterior half reddish brown; central and external basal cells hyaline; the posterior half hyaline; a little brownish at base of second submarginal cell. From Tasmania (*M. Bigot*). In the figure of insect the abdomen is marked with two light narrow stripes at base of abdomen and with a light apex. The colouring of wing is brown at base, crossing the lower part of discal cell and entering the base of fourth and fifth posterior cells; the first basal cell is almost wholly and the second one partly hyaline.

*Brachyrrhopola fenestrata*, Macq.

*Brachyrrhopola victoriæ*, Rüder.

In Brit. Mus. Coll. a female from Victoria (*French Coll.*).

The species was described by Macquart under his new genus *Codula*, with the type of the genus, viz. *Codula limbipennis*; but it is no doubt a species of *Brachyrrhopola*, a



genus founded by him in 1816 three years earlier, and from the description of *B. victoriae* there is no doubt Röder was redescribing a specimen of *C. fenestrata*.

Type in Paris Museum seen by me, a male.

A small black species with yellow bands on the second, third, sixth, and seventh segments of the club-shaped abdomen.

Face broad, with yellowish-grey tomentum at sides, leaving a black stripe in the centre. Moustache of yellow hairs. Antennae reddish (not black, as Macquart says); the third joint long, with indistinct style and minute spine. Head excised behind a little, with black incurved hairs. Legs long and slender, black; apical half of femora red; tibiae red, black at apices, bristles white and black. Wings brownish, all posterior cells open. There are no signs of stripes on the thorax, as given in Macquart's figure of this insect. Scutellum is red with whitish hairs. The curved spine on the fore tibiae is present, in spite of Macquart describing it as absent.

His description is as follows:—

Black. Abdomen white at apex, segments 2 and 3 with red margins. Legs red. Wings brown with clear spaces.

Length 3 lines, ♂. Face shining black; moustache white. Forehead and antennae black. Thorax with two small indistinct grey tomentose stripes. Abdomen shining; posterior border of second and third segments fawn-coloured; sixth and seventh yellowish white on posterior borders. Legs fawn-coloured; coxae black, femora on anterior half black; fore legs with no spines at apex (this is an error); tarsi black; first joint of posterior pair fawn-coloured, black at apex. Wings a little brownish, discal cell and base of first posterior white; base of wing clear.

From Tasmania.

### *Brachyrrhopola maculata*, Röder.

Described as from New South Wales.

Length, ♂ 15 mm., ♀ 20 mm.

♂. Antennae golden yellow. Face and moustache yellow. Thorax golden yellow with black stripes. Scutellum ochraceous. Abdomen club-shaped, ochre-yellow, the first segment somewhat dark, second one with two separated black spots, which are also present on the third, the fourth wholly black, the fifth black at sides. Legs ochre-yellow. Wings tinged golden yellow at base on fore border, darker towards apex, hyaline on posterior border. All cells open.

The female has the wings more golden yellow.

*Brachyrrhopola fulva*, ♀, sp. n.

Type (♀) and another from Mackay, Queensland (G. Turner).

A small species, the *wings* identical with those of *B. fenestrata*, but easily distinguished from it by the yellowish *abdomen*, with the base and last segments more or less blackish; *face* golden yellow; the *thorax* with stripes and short golden pubescence.

Length  $9\frac{1}{2}$  mm.

*Face* black in centre, shining, sides covered with golden tomentum; moustache yellow, the hairs paler at tips; palpi black with black hairs, scanty black hairs below and round head. *Antennæ* reddish yellow; first two joints stout, almost equal in length, the third long; the antennæ longer than the depth of head. *Thorax* blackish brown, with three median brown stripes shining through the yellow tomentum and pubescence, which is most apparent on the shoulders and anteriorly; sides of thorax and head black, with two golden-haired stripes; some long yellow hairs on thorax posteriorly; *scutellum* reddish. *Abdomen* reddish yellow; the first segment and anterior border of second black, remainder of second segment and the third shining yellowish, almost bare; the fourth, fifth, and sixth segments black on anterior borders, the last band the narrowest; the last three segments with short golden pubescence on the yellow part, the same pubescence appears but very sparsely on the other segments; the abdomen is club-shaped, the first two segments being narrower, the others convex; underside concave, blackish, yellow at base. *Legs* reddish yellow; coxæ, base of femora, and apices of anterior and posterior tibiæ and fore tarsi black. *Wings* greyish, on the fore border and base yellowish brown, with a brown band crossing the base of discal cell; the basal cells and discal cell almost entirely and the first posterior cell on its basal half hyaline; the small transverse vein below the middle of the discal cell. Halteres yellow.

This species is very probably identical with *Codula quadricincta*, Bigot, but without seeing the type it is impossible to decide.

The following Walker types belong to this genus:—

*Brachyrrhopola elaviventris* [*Dioctria*], from Dorey, New Guinea. Wings clear.

*B. inopinus* [*Dasypogon*], from New Guinea. Wings dark on fore border.

*B. indecorus* [*Dasypogon*], from New Guinea. Wings brown at apex.

*B. semifilatus* [*Dasypogon*], from Gilolo. Wings clear.

*B. solutus* [*Dasypogon*], from Gilolo. Wings clear.

## NEOCYRTOPOGON, gen. nov.

Distinguished by the very convex *face*, absence of antennal style, and by the posterior cells all being open.

Formed for one species, viz. :—

*Neocyrtopogon bifasciatus*, sp. n.

Type ♂, type ♀, from Townsville, Queensland (F. P. Dodd), and two other females. One male from Moreton Bay, Queensland.

A handsome species with slender fulvous abdomen, black at base and on second and fourth segments, with wings yellow at base and on fore border, with the apex and hind border widely grey. Legs and antennæ reddish yellow. Face very convex, deep golden yellow. Thorax with black bands and golden tomentum.

Length 19–20 mm.

Fulvous. *Head* wider than deep, the *face* very convex, projecting far above the plane of eyes : the moustache very scanty, confined to the oral opening ; *face* dull golden covered with yellow tomentum, the cheeks below, near the mouth, black, the bristles of moustache reddish yellow, the beard yellowish. *Palpi* red, with reddish pubescence. *Antennæ* reddish yellow ; the first and second joints about equal in length, with scanty reddish pubescence ; the third joint long and slender, with no distinct terminal style. *Forehead* same colour as face for half its depth, then black with three ocelli on vertex, a few reddish-yellow hairs on the black part, and those round the head posteriorly the same colour. *Thorax* dull fulvous, with a short broad black stripe on dorsum produced in the middle, reaching as a narrow stripe the anterior border of thorax, the shoulders and sides with golden tomentum, sides armed with reddish-yellow bristles, intermixed with these are some minute short yellow ones. *Scutellum* fulvous. *Abdomen* reddish yellow, sometimes more yellow ; the first segment black, fulvous on its posterior border, the second and third in the male slightly restricted, a black narrow band in the middle of the second one, the fourth wholly black, the fifth black on the sides and dusky on its anterior border, on sides of the first segment a tuft of yellow bristly hairs ; abdomen devoid of pubescence, shining, in the female, in the male minute fulvous bristles are apparent especially towards the apex ; genital organs prominent, with fulvous pubescence ; apex of abdomen in female armed with strong reddish bristles and with some fulvous pubescence ; underside black, reddish yellow on the second

and third segments, and in the male at the apex. *Legs* fulvous, the same colour as the abdomen; the coxæ black, the knees, apices of tibiæ, and the last joint of the tarsi usually brown. *Wings* yellow at base and on fore borders as far as the apex of the first basal cell, the centre of which and the apical half of the second basal cell with the apex of the wing, almost the whole of the discal cell and hind border of wing greyish brown, veins yellow on the yellow part, brown on the darker parts; all posterior cells and anal cell open, but the first and fourth posterior slightly narrowed at opening, and anal cell very narrow. Halteres yellowish.

RACHIOPOGON, gen. nov.

Distinguished from other genera in the division with curved spine to fore tibiæ, by the formation of third joint of *antennæ*, which is almost twice as long as the first two joints together, with no style to its blunt apex but notched on its upper side. Moustache confined to oral opening. *Thorax* and *scutellum* with bristles. *Legs* bare, armed with bristles. *Wings* with posterior cells open, but the fourth considerably narrower at border; the first vein from the discal cell bulges on its basal half into the first posterior cell.

Formed for one species originally described from Moreton Bay, N. Australia, in Mr. Gibbon's Coll.

*Rachiopogon grantii*, Newman.

Trans. Ent. Soc. London, n. ser. iv. p. 57 [*Dasypogon*] (1857).

The species is represented in Brit. Mus. Coll. by one female from S. Queensland (*Dr. T. L. Bancroft*), 1908. Newman's type is not in the Brit. Mus. Coll.

A handsome black fly, with fulvous wings and anterior and middle tibiæ on their basal half fulvous.

Length 20 mm.

*Face* slightly raised at oral opening, covered with golden-yellow tomentum, greyer at the sides. Moustache composed of yellow bristles placed round the oral opening. *Palpi* black, with strong black bristles at apex and with black hairs. Proboscis longer. Beard black. *Antennæ* blackish, the first joint of antennæ same colour as face but darker; the first two joints short, with a few black hairs, the third cylindrical, the notch at apex is best seen from behind, armed with a very short blunt spine. *Thorax* black, with about five black bristles at sides, beginning a short distance below shoulders. *Scutellum* black, with two bristles.



*Abdomen* dull black, the same width throughout, till the fifth, which with the last two segments is considerably narrower; the last two segments shining; on the posterior half of the first four segments some dull fulvous short pubescence is apparent. *Legs* dull black; the apices of fore femora, the basal half of fore tibiæ, and the basal third of middle tibiæ fulvous, fore and middle coxæ with white hairs; the legs are armed with black bristles of varying length, two very long ones are present on each side of the middle tibiæ, and a shorter one on the fore tibiæ. *Wings* fulvous, a little paler at apex and on posterior border, veins fulvous; the second posterior cell bulges into the first posterior on its basal half, the first posterior not narrower at border, the fourth narrower at border but not closed; the anal cell very narrow but not quite closed, the fork of third vein is long, the small cross-vein is placed beyond the middle of discal cell. Halteres fulvous.

#### NEOSAROPOGON, gen. nov.

Distinguished from *Saropogon* by the large size of the species, by the absence of any visible style to third joint of *antennæ*, by the fourth posterior cell of *wing* being not quite closed or widely open, and by the moustache being composed of numerous bristles about the same size arranged fan-like above the oral opening.

In two of the species included in this genus the first vein from the discal cell bulges at the base into the first posterior cell, and the fourth posterior cell is much narrowed at border; in the third species, *N. princeps*, it is widely open.

The species as yet known are :—

- Neosaropogon princeps*, Macquart, Dipt. Exot. Suppl. iii. p. 179, pl. i. fig. 14 [*Dasyopogon*] (1848); v. d. Wulp, Tijds. v. Entom. xix. p. 172 [*Laparus*] (1876); Bigot, Ann. Soc. Ent. France, (5) viii. p. 222 [*Plesiomma*] (1878); Williston, Trans. Amer. Ent. Soc. Philad. xviii. p. 76 [*Dasyopogon*] (1891); Kertész, Cat. Dipt. p. 121 [*Neolaparus*] (1909); Froggatt, Australian Insects, p. 300 [*Saropogon*] (1907).—*Dasyopogon allia*, Walker, List Dipt. ii. p. 334 (1849), et vi. Suppl. ii. p. 487; Kertész, List Dipt. p. 63 [*Isopogon*] (1909). *Dasyopogon carus*, Walker, l. c.; Kertész, l. c. [*Isopogon*]. *Dasyopogon numicius*, Walker, l. c. p. 335; Kertész, l. c. [*Isopogon*].
- Neosaropogon salinator*, Walker, List Dipt. ii. p. 325 [*Dasyopogon*] (1849), et vi. Suppl. ii. p. 477 [*Dasyopogon*] (1854); Kertész, Cat. Dipt. p. 66 [*Heteropogon*] (1909).
- Neosaropogon claripennis*, sp. n.

#### *Neosaropogon princeps*, Macq.

*Dasyopogon canus*, Walker.

*Dasyopogon numicius*, Walker.

*Dasyopogon allia*, Walker.

Macquart's type was recorded from New South Wales, and he notes another specimen as from Brazil.

Macquart's type (♀) and three other female specimens, all varying in size, were seen by me in the Paris Museum. In the type the third segment is almost wholly dark, in the other specimens only dark on the anterior border as in the specimens in the British Museum. Apex of abdomen furnished with circle of spines.

Walker's three types were described from unknown localities.

There are specimens in the Brit. Mus. Coll. from Australia, New South Wales. Mr. Froggatt records a specimen from Mittagong, New South Wales.

This species cannot belong to *Neolaparus*, owing to the different formation of the moustache and the absence of antennal style. It is distinguished from the other two species placed in this genus by the more open fourth posterior cell, the last part of its upper vein not turning sharply downwards, and the first vein from the discal cell does not bulge into the first posterior cell. It varies in size greatly, judging from the specimens in the British Museum Coll., which measure from 22-25 mm. (males), 15-22 (females).

The moustache is composed of stout bristles. The *antennae* are reddish yellow; the first two joints with yellowish hairs and some bristles; the third bare, cylindrical, in one male nearly three times as long, in two females only twice as long as the first two joints together. The bristles at sides of thorax are rather short and yellow, the *scutellum* apparently devoid of them.

### *Neosaropogon salinator*, Walker.

Type (♀) and another female from Port Essington, N. Australia, and a male and female from Port Darwin, N. Australia (*Buckland*).

Distinguished from *Neosaropogon claripennis*, sp. n., by the shorter, more club-shaped third antennal joint, by the wholly yellow legs (only the coxæ are darker), and the more distinctly banded abdomen.

Length 23-27 mm.

Yellowish, with black bands on abdomen. *Face* pale yellow, the bristles yellowish white. *Antennae* reddish yellow; the first two joints with yellow hairs and a few black bristles; the third bare, rather club-shaped, about one and a half times as long as the first two joints together. *Thorax* greyish brown, with traces of three black stripes; sides with

yellowish tomentum; four black bristles above and two below root of wing, *scutellum* with two long black ones. *Abdomen* dull yellowish, with blackish bands on the anterior borders of segments, becoming broader towards the apex, which in the female is almost wholly black. *Legs* yellow; the *coxæ* black, covered with greyish tomentum and long yellowish hairs. *Wings* faintly tinged brown at apex; venuration as in *N. claripennis*, but the fourth posterior cell is rather more open. Halteres yellow.

*Neosaropogon claripennis*, sp. n.

Type (♂) and another from Townsville, Queensland (*F. P. Dodd*), and type (♀) and another from same locality.

A species with dark reddish-brown abdomen, indistinctly marked with black; legs lighter, reddish yellow, with tarsi black. Antennæ reddish yellow. Wings clear; fourth posterior cell narrowed at opening.

Length 23 mm. One female measures only 16 mm.

Dark reddish brown. Head wider than it is deep. *Face* slightly convex, a dull yellowish deep chamois-leather colour, with golden tomentum; moustache of long yellow bristles. *Palpi* black, with yellowish pubescence. Beard yellowish. *Antennæ* reddish yellow; the third joint nearly three times as long as the first two joints together, cylindrical, bare, ending in an obtuse point; the first two joints with hairs. *Forehead* blackish, but covered with yellowish tomentum; hairs round head stout, reddish yellow. *Thorax* black, when not denuded more or less covered with dull brownish-yellow tomentum; shoulders and sides with golden-yellow tomentum; dorsum with short black bristles; sides with yellowish-red hairs and two long black bristles above root of wing, four or more below root of wing, and shorter ones at base of thorax; *scutellum* with two long black bristles, colour and tomentum as in thorax. *Abdomen* reddish, indistinct blackish markings on the middle segments, base of first segment black, some short yellow hairs at sides and long ones at apex in the male; dorsum almost bare, but very short black hairs are apparent when closely examined; in the female the *abdomen* appears lighter in colour, more yellowish; in both sexes on side of first segment at the base is a tuft of stout bristle-like yellow or reddish hairs, apex of female with short red bristles; underside reddish brown or reddish yellow, with blackish segmentations. *Legs* reddish yellow; *coxæ* black, with some white hairs; knees of posterior tibiæ and the last four tarsi on all the legs black; femora with very few black bristles,

tibiæ and tarsi with numerous ones. *Wings* hyaline: veins yellow; the first vein from the discal cell bulges at the base into the first posterior cell, which is open at border; the fourth is also open, but the last part of its upper vein from the transverse vein enclosing the discal cell turns so sharply downwards that it almost closes the cell, leaving only a narrow opening at border. *Halteres* yellow.

[To be continued.]

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LXV.—*A Synoptical Revision of the Coleopterous Genus Hexodon (Dynastinæ).* By GILBERT J. ARROW.

(Published by permission of the Trustees of the British Museum.)

THE genus *Hexodon* forms a very homogeneous and peculiar group of species confined to Madagascar and owing its chief distinctive feature to the loss of the wings, a highly exceptional phenomenon in the Dynastinæ, but evidently here of very ancient date. It has been accompanied, as in apterous Coleoptera of various other groups, by the development of lateral folds to the elytra and the reduction of the shoulder prominences, and the latter feature has been balanced in *Hexodon* by the horizontal development of the lateral folds and the production of secondary or false shoulders.

A further peculiarity is found in the structure of the antennal club, the first joint of which is drawn out in such a way that the point of articulation of the penultimate joint is removed to near its middle.

The sexual characteristics of the genus, which have not been noticed, although strongly marked, are interesting as combining two opposite tendencies exhibited in the Dynastinæ. In a large part of that subfamily the males have the front claws unsymmetrical and the inner one enlarged and distorted or toothed. This is almost always accompanied by a considerable shortening and thickening of the front tarsus. In another great division all the tarsi, but especially the front ones, are elongated in the males, the claws remaining simple and symmetrical. In *Hexodon* the inner front claw is thickened and distorted, but at the same time there is a great elongation of all the tarsi as in the second division. The pygidium is vertical in the male and oblique and more exposed in the female.

The combination of features elsewhere distinctive of



different groups seems to indicate the genus as representing the ancestral type from which both have been derived. Aberrant as it is, it is not remotely related to *Dyscinetus* and the rest of the Cyclocephalini, in which, however, the more recent character of the contraction (instead of elongation) of the front tarsus of the male prevails, elongation being an ancient condition found in many groups of Lamellicornia.

The Cyclocephalini are a large and flourishing group, almost entirely confined to America. *Ruteloryctes tristis*, Arrow, is a solitary representative in Africa, and it seems that *Hexodon* is another example of the survival in Madagascar of an ancient type formerly widespread, but now almost extinct in the Old World. There is great dissimilarity in aspect, as there must also be in habits, between *Hexodon* and the flower-haunting Cyclocephalini of the New World, and it seems that, as with *Hypocephalus* and many other "living fossils," survival from the remote past has been due to the acquisition of peculiar sluggish and lurking habits.

In the 'Catalogue of Madagascar Coleoptera' by M. Alluaud published in 1900, four species of *Hexodon* are enumerated; but of these *H. hopei*, Koll., as I have found by examination of Hope's original specimen at Oxford, is identical with *H. unicolor*, Oliv. Another name, *H. rotundatum*, occurs upon the plates published long before in connection with the same work, and the examination in the Paris Museum of the specimen figured has proved it to be a rubbed female specimen of *H. reticulatum*, Oliv.

The number of known species has been raised to five by the description of *H. griseosericans*, Fairmaire, and *H. minutum*, Sternberg. A co-type of the former is in the British Museum and I have seen a second co-type in the collection of Dr. Sicard. I have also been allowed to examine the type of *H. minutum*, which is now the property of Herr H. Prell, and that of *H. reticulatum*, Oliv., from the Dufresne collection in the Edinburgh Museum.

I have examined altogether considerably more than a hundred specimens of the genus in order to obtain as clear an idea as possible of its specific differentiation. All the specimens fall readily into two groups, which have numerous and well-marked differences; but within these two groups subdivision is much less easy, owing to the considerable variation in shape and sculpture and the absence of any important structural differentia.

In the first division, represented by the first-described species, *H. reticulatum*, Oliv., the elytra are not abbreviated,

meet in a sharp angle at their extremities, and, in the males at least, completely hide the abdomen as seen from above. The visible part of the mesonotum is smooth and shining, with or without a cluster of minute punctures on the scutellum, which is very short and broad; the prosternal process is rather long and erect, and in the male the penultimate joint of the front tarsus is produced beneath the last joint into a slender rod almost as long as the rest of the joint.

In the second division, represented by *H. unicolor*, Oliv., the elytra are abbreviated and separately rounded behind (or at least their posterior edges do not form a continuous line), and the end of the abdomen is almost always visible from above. The exposed part of the mesonotum is entirely opaque and finely sculptured, the scutellum forming a well-marked lobe, the prosternal process is triangular and very short, and the male has only a short prolongation of the penultimate joint of the front tarsus or none at all.

The investigation of the genitalia of male Dynastinae frequently reveals striking differences in species which have a close external resemblance and is an indispensable criterion in cases of difficulty. The investigation in the present case has produced rather surprising results. The species of the first division are entirely unlike the remaining species in the form of the œdeagus, while showing only very slight differences between themselves. The paramera are long and slender and the left one (as seen from behind) has an overlapping internal flange.

In the second division the œdeagus is symmetrical and the paramera shorter and very markedly different in shape in the three species, although externally these are no more dissimilar than those of the first division.

Before making a careful study of this organ I regarded some of the forms of the very variable *H. unicolor* as specifically distinct, but the uniformity of their genitalia as contrasted with the dissimilarity found in the three species just mentioned obliged me to abandon that idea. On the other hand, to treat very slight differences in the form of the œdeagus as specifically insignificant would imply the non-validity of such (externally) very distinct forms as *H. patella* and *H. latissimum*. Thus this structure not only provides confirmation of the naturalness of the primary subdivision of the genus based upon external characters, but is the only really trustworthy criterion of species.

I have therefore been impelled to accept any tangible and apparently constant degree of difference in this respect

as indicating specific distinctness, while the amount of difference, when the marked constancy of this character is contrasted with the no less marked inconstancy of the external form of these beetles, must be held to show much more clearly than the latter the relationships existing between the species. We have here, in fact, a structure which is both more plastic, as shown by the extraordinary diversity of its forms often to be found in species undoubtedly very closely related to one another, and more stable, as seen in its constancy of shape when examined in a series of similar individuals, than any external character, and which by its nature is the best anatomical indicator of the possibility or otherwise of interbreeding. Reliance upon it will undoubtedly produce results sometimes conflicting with ideas of species which have been based only upon external features, and it may be necessary, in the absence of any other term, still to describe as "species" forms which show marked external differences without apparently any corresponding genital characters; but still more must we admit that, where distinct forms of genitalia occur, even if no external difference can be found (and I believe such cases to exist), these must be accepted as indicating distinct species.

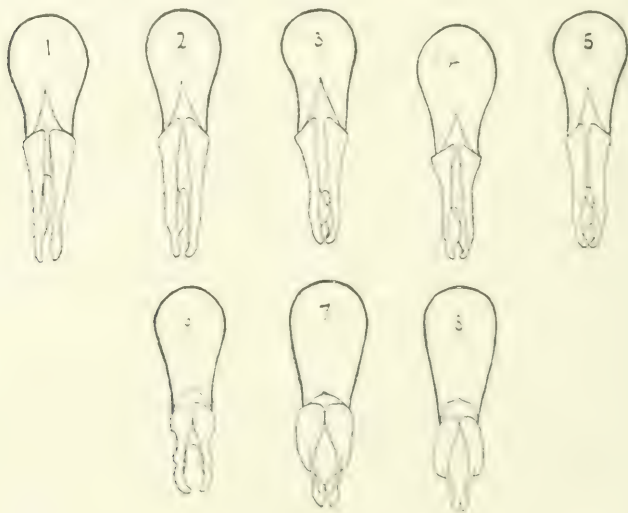
In the present genus there is a concurrence of characters, internal and external, in all the forms I have distinguished, and it consists, so far as at present known, of a group of five exceedingly closely related and probably lately evolved species, forming the *reticulatum* group, and three more ancient and less closely interrelated species, forming also a natural group (the *unicolor* group).

The following synopsis gives the most salient characters of each species:—

- |  |                                   |
|--|-----------------------------------|
| 1 (10). Posterior angles of the elytra sharp.<br>( <i>reticulatum</i> group.)                            |                                   |
| 2 (3). Body very convex, with scarcely<br>flattened elytral margins . . . . .                            | 1. <i>montandoni</i> , Buq.       |
| 3 (2). Body not very convex, with dis-<br>tinctly flattened elytral margins.                             |                                   |
| 4 (7). Hind angles of the pronotum<br>rounded.   |                                   |
| 5 (6). Apical angles of the elytra slightly<br>produced. . . . .   | 2. <i>reticulatum</i> , Oliv.     |
| 6 (5). Apical angles of the elytra not pro-<br>duced . . . . .   | 3. <i>patella</i> , sp. n.        |
| 7 (4). Hind angles of the pronotum sharp.  |                                   |
| 8 (9). Lateral margins of the elytra<br>narrow; elytra together scarcely<br>broader than long . . . . .  | 4. <i>griseosericans</i> , Fairm. |
| 9 (8). Lateral margins of the elytra broad;<br>elytra together distinctly broader<br>than long . . . . . | 5. <i>latissimum</i> , sp. n.     |

- 10 (1). Posterior angles of the elytra not sharp. (*unicolor* group.)  
 11 (12). Posterior angles of the pronotum not or scarcely extending farther back than the middle of the base. *G. unicolor*, sp. n.  
 12 (11). Posterior angles of the pronotum produced beyond the middle of the base.  
 13 (14). Large; elytra not very convex, with the outer margins strongly flattened; mesonotum entirely opaque..... *7. unicolor*, Oliv.  
 14 (13). Small; elytra highly convex, with the outer margins not at all flattened behind; mesonotum smooth and shining in front of the scutellum ..... *8. minutum*, Sternb.

I have represented in outline the male genitalia of all these eight forms (the figures being numbered to correspond with those above), and descriptions of the three which are new now follow.



*Hexodon patella*, sp. n. (See fig. 3.)

Rotundatum, fere circulare, marginibus lateralibus valde dilatatis; rufum, supra toto opacum, utroque elythro plaga antica punctisque duabus antepicalibus nitidis ornato: capite (clypeo excepto), pronoti medio (linea mediana excepta) elytrorumque sutura et lineis vagis longitudinalibus infuscatis: corpore subtilis nitido:



pedibus, prothoracis lateribus elytrorumque epipleuris late rufis; capite antice minute emarginato, sutura clypeali fere toto obsoleto; pronoto brevi, angulis posticis rotundatis, vix productis, basi levissime arcuato; scutello lato, paulo concavo, opaco, subtiliter ruguloso; elytris convexis, lateribus ubique regulariter armatis, antice late explanatis, apicibus conjunctim recte subtruncatis; processu prosternali prominentissimo, gracili. Long. 25 mm.; lat. max. 18.5 mm.

*Hab.* S.W. Madagascar: near Fort Dauphin.

The male type specimen in the British Museum is the only example of the species known to me. It has the nearly circular outline of *H. montandoni*, but is much less convex and more nearly related to *H. latissimum*. The coloration is quite peculiar. The ground-colour is a reddish chocolate, with the legs rather bright red, and the posterior part of the head and the middle of the pronotum, except a narrow median red line, nearly black. The hind angles of the pronotum are rounded and scarcely produced. The prosternal process is very long and slender.

*Hexodon latissimum*, sp. n. (See fig. 5.)

Nigrum, corpore subius nitido, supra opaco, griseo-vestito, sed mesonoto polito, nitido, scutello lato, crebre punctulato; capite, prothorace, elytrorumque costis obscurioribus, costis ad marginem anticam (duabus internis nonnunquam etiam ad medium) confluentibus, postice abbreviatis; corpore latissimo, fere circulari, pronoto antice valde contracto, basi omnino fere regulariter emarginato, angulis posticis acutis; elytris conjunctim latioribus quam longioribus, apicibus recte subtruncatis, lateribus antice late deplanatis; processu prosternali erecto, sat gracili. Long. 25 mm.; lat. 18–19 mm.

*Hab.* N.W. Madagascar; Majunga.

The British Museum is indebted for a specimen of this to Dr. A. Sicard, in whose collection there is a second specimen.

This species is very closely related to *H. griseosericans*, although the much greater breadth of the elytra gives it a very different appearance. The dark elytral costæ are nearly parallel and not irregular as in *H. reticulatum* and are alternately strongly and feebly developed. The first and second primary costæ terminate at the apical callus and in the type specimen they also unite in the middle; but this may be exceptional, as in some examples of *H. reticulatum*. The second, third, and fourth primary costæ, and the intervening secondary ones, unite at the humeral callus, which lies in the middle of the anterior margin. The apical callus lies nearer to the apical and sutural edges of the elytron

than in *H. unicolor*, and the abrupt posterior termination of the third primary costa forms an additional callus which is present also in *H. griseosericans*.

*Hexodon unicostatum*, sp. n. (See fig. 6.)

Piceum, capite pronotoque nigrescentibus, pedibus sat læte rufis, corpore supra opaco, griseo-vestito; prothoracis et elytrorum marginibus extremis, singuli elytri vittaque arcuata paulo elevata postice abbreviata nitidis; ovatum, postice latissimum, clypeo antrorsum paulo contracto, sutura nulla; prothorace haud latissimo, basi leviter trisinuato, angulis posticis haud acutis aut valde productis; scutelli medio dense punctulato; elytris conjunctim latoribus quam longioribus, lateribus autem haud late deplanatis, postice truncatis, angulis suturalibus minute rotundatis; prosterno postice haud erecto:

♂, tarsi 4 anterioribus quam tibiis longioribus, posticis paulo brevioribus, pygidio convexo, haud porrecto:

♀, tarsi posticis quam tibiis multo brevioribus, pygidio porrecto. Long. 17-19 mm.; lat. max. 11.5-12.5 mm.

*Hab.* N.E. Madagascar; Antongil Bay.

The type specimen (received from Herr Felsche) is in the British Museum, and I have also examined a series in the Paris Museum containing both sexes, a pair of which has been kindly presented.

The species is a rather small one of distinctive shape, the prothorax being relatively narrower than is usual, and the elytra short and broad, but without strongly developed lateral flanges. The posterior angles of the prothorax are rounded and only slightly produced backwards, so that they are in a line with the slightly prominent median lobe. The mesonotum is closely punctured and opaque and the scutellum forms a well-marked lobe. There is a single smooth and shining median carina upon each elytron, extending from the middle of the basal margin to the apical callus when fully developed, but sometimes widely interrupted. The prosternum does not form a free process behind the coxæ, and the legs are rather less elongate in the male than in the other species of the genus.

#### MISCELLANEOUS.

WE omitted to mention in our April number that our thanks are due to the Trustees of the British Museum (Natural History) for kindly lending us the process-block illustrating Mr. Arrow's paper on *Phytalus smithi* (p. 456).

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 54. JUNE 1912.

LXVI.—*On the Development of the Teeth of the Soricidæ: an Ontogenetical Inquiry.* By Dr. AUGUSTA ÄRNBÄCK-CHRISTIE-LINDE (Zootomical Institute, University of Stockholm) \*.

[Plates XVIII. & XIX.]

WHEN examining the teeth of the shrews, one is struck with the enormous development of the anterior incisors in both jaws and with the reduced number of the antemolar teeth, especially in the lower jaw. One cannot help combining these two facts, the comparative anatomy offering plenty of instances showing that the enlargement of a tooth involves the reduction or even the disappearance of neighbouring teeth. The question then arises, how many and which teeth have been suppressed, and, further, how the small antemolar teeth are to be homologized.

Another question which has not hitherto been definitely decided is whether the shrews have a milk-dentition or not. Some authors are of opinion that these animals have no milk-dentition, but others pretend to have found calcified milk-teeth.

Through an ontogenetical investigation I hoped to find an

\* This article is a *résumé* of my paper "*Der Bau der Soriciden und ihre Beziehungen zu andern Säugetieren: Part II.*," now publishing in *Morphol. Jahrbuch*, Bd. xlv.

answer to these questions and at the same time to get a clue to the phylogeny of the Soricidæ.

I have examined the following shrews by means of serial sections :—

*Sorex araneus* : 3 stages.

I. Fœtus : head-length about 8 mm., body-length\* about 11 mm.  
3 specimens.

II. Fœtus : head-length about 9 mm., body-length about 13 mm.  
3 specimens.

III. Very young, almost hairless *Sorex* : head-length about 19 mm.,  
body-length about 33 mm.  
1 specimen.

*Neomys (Crossopus) fodiens* : 1 stage.

Fœtus : head-length about 9 mm., body-length about 17 mm.  
2 specimens.

*Crocidura russula* : 3 stages.

I. Fœtus : head-length about 8 mm., body-length about 12½ mm.  
2 specimens.

II. Fœtus : head-length about 8 mm., body-length about 12 mm.  
2 specimens.

III. Fœtus : head-length about 9 mm., body-length about 12½ mm.  
1 specimen.

Fœtal specimen of a shrew (probably *Crocidura*) : body-length about 10 mm.

The above measures have been taken on preserved specimens.

The results of my investigation of the tooth-development of *Sorex araneus* may be thus expressed :—

$$\begin{array}{cccccccccccc}
 I^1 & I^2 & I^3 & I^4 & I^5 & C & P^1 & P^2 & P^3 & P^4 & M^1 & M^2 & M^3 \\
 Id^2 & Id^4 & Id^5 & Cd & Pd^1 & Pd^2 & Pd^3 & Pd^4 & & & & & \\
 Id_1 & & & — & Pd_1 & Pd_2 & — & Pd_1 & & & & & \\
 I_1 & I_2 & I_3 & I_4 & (C) & P_1 & P_2 & (P_3) & P_4 & M_1 & M_2 & M_3.
 \end{array}$$

In giving the tooth-formulas of the other shrews which I have investigated I have used the same designation for teeth which are probably homologous.

The reconstructions of the ectodermal parts of the teeth are made by Dr. N. Odhner, whose reconstructing method is described in *Anatom. Anzeiger*, Bd. xxxix. 1911, p. 273.

\* I have taken this measure from the crown of the head to the posterior flexure of the body.



## SOREX ARANEUS.

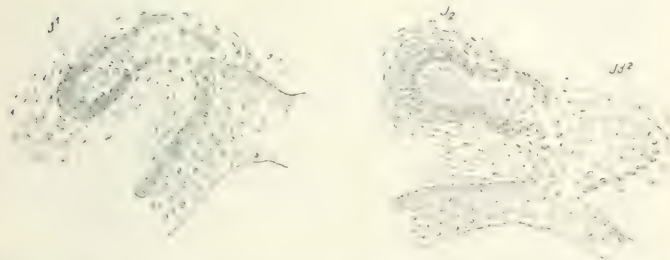
*The germs of the permanent teeth.**The upper jaw.**Fœtus: body-length about 11 mm.*

At this stage the tooth-band forms a continuous curve, its two halves being connected in the middle. The anterior part of the tooth-band, *i. e.* the part situated in front of the large functional incisors, is well developed. The tooth-band projects deeply into the mesoderm, especially the anterior and posterior parts, from which the largest enamel-organs arise.

The germs of the three functional incisors are well developed. In front of the largest incisor two more tooth-germs are observable, most probably representing two suppressed incisors,  $I^1$  and  $I^2$  (text-figs. 1 & 2; Pl. XVIII. fig. 1). As

Fig. 1.

Fig. 2.



*Sorex araneus*.—Fœtus (11 mm.). Upper jaw. Transverse section.  
Fig. 1.  $I^1$ . Fig. 2.  $I^2$ , with vestigial milk predecessor ( $Id^2$ ).  $\times 220$ .  
The left side of the figure represents the lingual and the right the labial side of the jaw.

appears from the figure, these rudiments are very distinct, seen from the inner side of the tooth-band. We can thus distinguish germs of five incisors, *i. e.*  $I^1$ ,  $I^2$ ,  $I^3$ ,  $I^4$ ,  $I^5$ .  $I^1$  and  $I^2$  are bud-shaped, as are also  $I^4$  and  $I^5$ , the rudimentary  $I^1$  and  $I^2$  being of course much less differentiated than  $I^4$  and  $I^5$ .  $I^3$ , the functional first incisor, is bell-shaped. On the lingual side of this tooth the free deep end of the tooth-band is swollen, forming a bud (Pl. XVIII. fig. 1, Z/). Whether this be a tooth-germ or not may be an open question.

Certain it is that there is material enough for giving rise to a successional tooth.

Between the morphological  $P^5$  and the next functional tooth there is a distinct bud-shaped tooth-rudiment, representing the canine according to the general terminology (text fig. 3). This is the first antemolar tooth-germ situated

Fig. 3.



*Sorex araneus*.—Fœtus (11 mm.). Upper jaw. Transverse section. C with milk predecessor (Cd).  $\times 220$ . The left side of the figure represents the lingual and the right the labial side of the jaw.

within the confines of the ossifying maxilla, all the above-mentioned tooth-germs being situated within the confines of the ossifying premaxilla. This is at least the case in the fœtal stage. How it is in the adult animal I cannot decide. It may be, as Brandt\* states, that the premaxillo-maxillary suture in the adult lies between the fourth and the fifth antemolars. Yet for all that the functional fourth tooth is not an incisor and the functional fifth tooth is not a canine, but both are premolars, as will appear from the following.

The tooth-germ of the canine not being visible in the reconstruction figure, I refer to the text-figure 3.

The presence of a rudimentary canine excludes every doubt that the following four antemolar germs represent the premolars. The set of premolars is thus complete.  $P^1$ ,  $P^2$ , and  $P^3$  are well developed, the two first-mentioned being bud-shaped and the latter bell-shaped.  $P^4$ , on the contrary, is retarded in its development, and at this stage hardly differentiated from the tooth-band (Pl. XVIII. fig. 1).

As to the molars,  $M^1$  and  $M^2$  are represented by distinct tooth-germs,  $M^1$  being bell-shaped.  $M^2$  bud-shaped;  $M^3$  is not yet distinctly differentiated.

\* Brandt, Ed., "Untersuchungen über das Gebiss der Spitzmäuse," Bulletin de la Société impériale des Naturalistes de Moscou, xliii. 2 (1870), xlv. 2 (1873).

*Fetus: body-length about 13 mm.*

The tooth-band has not completely lost its connection with the buccal epithelium: also in this specimen it is continuous, but its anterior part is here somewhat reduced.

The tooth-rudiments of  $I^1$  and  $I^2$  are distinctly differentiated, but show obvious traces of reduction. As regards  $I^3$ , a thin layer of dentine is formed. Here, too, the free deep end of the tooth-band forms a bud on the lingual side.  $I^4$  is bell-shaped and  $I^5$  cup-shaped.

The germ of C is not distinguishable at this stage.

As to the degree of development, the premolars differ but little from those of the above stage. Only  $P^2$  is a little more differentiated, though still retarded in its development as compared with the other premolars.

On the lingual side of  $P^4$  the free deep end of the tooth-band is swollen like a bud.

The molars are all differentiated:  $M^1$  and  $M^2$  are bell-shaped and  $M^3$  is represented by a bud.

*Young Sorex: body-length about 33 mm.*

Unfortunately I could not pursue this investigation on foetal specimens. The next stage which I have examined is therefore that of a young *Sorex*, blind and almost hairless.

The tooth-band is totally absorbed. No traces of the rudimentary teeth  $I^1$ ,  $I^2$ , and C are to be seen.

Of the permanent dentition all the functional teeth are developed, *i. e.* three incisors—the morphological  $I^3$ ,  $I^4$ ,  $I^5$ ,—the four premolars, and the three molars. They are all calcified, but none of them, not even the enormous  $I^3$ , has cut the gums.

*The lower jaw.*

*Fetus: body-length about 11 mm.*

The tooth-band forms a continuous curve, as in the upper jaw, *i. e.* the two halves are connected in the middle.

In front of the enamel-organs of the large functional incisors the tooth-band is swollen, to give rise most probably to three rudimentary tooth-germs— $I_1$ ,  $I_2$ ,  $I_3$ . These rudiments, being more differentiated in the older foetal specimen, are described below.

The enamel-organ of the morphological  $I_4$ —*i. e.* the functional first incisor—is bell-shaped and much in advance of the other teeth. On the lingual side of this tooth the free

deep end of the tooth-band is thickened, forming a bud, as in the upper I<sup>3</sup>.

Behind I<sub>1</sub> the tooth-band swells out a little, to give rise to a structure which may be a trace of the lower canine. This structure being less distinctly differentiated than the corresponding upper tooth-rudiment, I have only with some hesitation designated it as a tooth-germ. In earlier stages this rudiment may possibly be more differentiated from the tooth-band.

In the fœtal *Neomys (Crossopus) fodiens* the presence of a lower canine is beyond doubt.

Considering the above-mentioned facts, the next tooth is most probably P<sub>1</sub>, being here cup-shaped.

Between this tooth and the last antemolar one, *i. e.* P<sub>4</sub>, there are two rudimentary germs, those of P<sub>2</sub> and P<sub>3</sub>. P<sub>2</sub> is more distinctly differentiated from the tooth-band than P<sub>3</sub>.

Woodward\* has also observed the tooth-rudiment P<sub>2</sub>, but regards it as the third lower incisor.

P<sub>3</sub> is represented only by a slight swelling of the tooth-band. P<sub>4</sub> is bell-shaped.

As to the molars, M<sub>1</sub> and M<sub>2</sub> are represented, the former by a bell-shaped, the latter by a cup-shaped tooth-germ. M<sub>3</sub> is not yet differentiated.

*Fœtus: body-length about 13 mm.*

This stage does not differ much from the one just described, only the rudimentary incisors are somewhat more differentiated.

The two halves of the tooth-band are connected in the middle. The part of the tooth-band situated in front of the large functional incisors presents three swellings on each side, which are still connected with the buccal epithelium. These swellings most probably represent reduced incisors, I<sub>1</sub>, I<sub>2</sub>, I<sub>3</sub>. Transverse sections through these structures are here figured (text-figs. 4-6).

In I<sub>4</sub> the calcification has begun. The free deep end of the tooth-band is swollen. Between I<sub>4</sub> and P<sub>1</sub> there is a gap, but I could find no swelling of the tooth-band there. As to the germs of the functional premolars, P<sub>4</sub> is bell-shaped and P<sub>1</sub> is about to assume this form.

\* Woodward, M. F., "Contributions to the Study of Mammalian Dentition.—Part II. On the Teeth of certain Insectivora," Proc. Zool. Soc. London, 1896.



No traces of  $P_2$  and  $P_3$  are to be seen.

$M_1$  and  $M_2$  are not yet calcified.  $M_3$  is represented by a large swelling of the tooth-band.

Fig. 4.



Fig. 5.

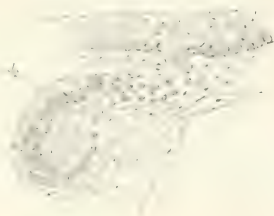
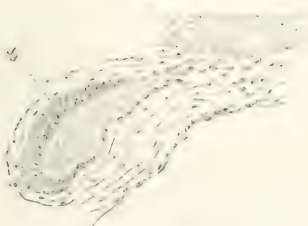


Fig. 6.



*Sorex araneus*.—Fœtus (13 mm.). Lower jaw. Transverse section. Fig. 4.  $I_1$ . Fig. 5.  $I_2$ . Fig. 6.  $I_3$ .  $\times 220$ . The left side of the figure represents the lingual, the right the labial side of the jaw.

*Young Sorex*: body-length about 33 mm.

The tooth-band is absorbed. Only a few cells in the middle remain. The anterior rudimentary incisors,  $I_1$ ,  $I_2$ ,  $I_3$ , are represented by highly vestigial but distinct structures (Pl. XIX. figs. 1, 2). They are connected with the remains of the tooth-band by a few cells.

As to the other teeth, what is said of the upper functional ones is also true about them: the functional lower teeth— $I_1$ ,  $P_1$ ,  $P_2$ ,  $M_1$ ,  $M_2$ ,  $M_3$ —are all calcified, but none of them has cut the gums.

A vestige of the bud-like free deep end of the tooth-band on the lingual side of  $I_4$  is distinguishable.

#### *The milk-teeth.*

The presence of a milk-dentition has hitherto been a

subject of dispute. Some authors are of opinion that there is no such dentition, *e. g.* Leche\*, who, having microscopically examined several foetal stages without finding any trace of milk-teeth, comes to the conclusion that the Soricidae have only one dentition.

Woodward (*l. c.*) is the first who has found rudiments of real milk-teeth in *Sorex*, the calcified "milk-teeth," the existence of which Owen† and Tauber‡ have stated, being the cusps of the permanent teeth.

The question whether a milk-dentition exists or not is thus decided. However, I hope that the result of my investigation may be of some interest, as Woodward has examined only one stage of *Sorex* and observed only a few uncalcified rudiments.

*The upper jaw.*

*Fœtus: body-length about 11 mm.*

The first labial growth of the tooth-band met with is related to the rudimentary  $I^2$ , and is thus  $Id^2$ . It is a highly vestigial structure, as might be expected (Pl. XVIII. fig. 1; text-fig. 2).

All the functional antemolar teeth with the exception of the large  $I^3$  have predecessors in the milk-dentition (Pl. XVIII. fig. 1). Besides, I have found a predecessor of the rudimentary C (text-fig. 3).

The milk-dentition in the upper jaw thus consists of  $Id^2$ ,  $Id^4$ ,  $Id^5$ , Cd,  $Pd^1$ ,  $Pd^2$ ,  $Pd^3$ ,  $Pd^4$ .  $Id^2$ , Cd, and  $Pd^2$  are represented by highly vestigial minute buds, and  $Id^4$  by a comparatively large labial outgrowth from the tooth-band.

The other milk-teeth are cup-shaped.

One of the most interesting points in connection with I is the fact that the tooth-band here gives rise to three outgrowths from the same point, representing three dentitions. The lingual one ( $I^3$ ) developing to a permanent tooth, the labial ones must be traces of older dentitions, *i. e.* of the lacteal and prelacteal dentitions (Pl. XVIII. fig. 1, *Pl.*).

Also in *Erinaceus europæus* on the labial side of the corresponding functional tooth— $I^3$ —there are traces of two dentitions, as appears from Leche's figures (*l. c.* Taf. vi. figs. 37–40). Leche, having overlooked this fact, mentions

\* Leche, W., "Zur Entwicklungsgeschichte des Zahnsystems der Säugetiere," Teil i., Bibl. Zool. (Stuttgart, 1895).

† Owen, R., 'Odontographie,' i. & ii. (London, 1840–45).

‡ Tauber, P., "Om Tandsæet og Levemaade hos de danske Flagermus og Insektaedere," Naturhistorisk Tidsskrift, Bd. viii. (1872–73).

in the text only one labial bud, which he regards as  $Id^3$  (*l. c.* pp. 28, 30).

No doubt the last-mentioned bud ought to be interpreted in the same way as the corresponding one ( $Pl.$ ) in *Sorex*, *i. e.* as a prelaeteal vestige, the real third milk-tooth,  $Id^3$ , being an early vanishing structure.

*Fœtus: body-length about 13 mm.*

In this fœtus only those milk-teeth which in the last-mentioned specimen are cup-shaped, *i. e.*  $Id^1$ ,  $Pd^1$ ,  $Pd^3$ , and  $Pd^4$ , are remaining. They are all represented by very minute calcified tooth-rudiments, which probably never cut the gums. The presence of calcified milk-teeth in *Sorex* is thus substantiated.

*Young Sorex: body-length about 33 mm.*

I have found no trace of upper milk-teeth in the young *Sorex*. As the specimen examined was blind and almost hairless, and consequently at most a few days old, it is most probable that the milk-teeth disappear before birth.

*The lower jaw.*

*Fœtus: body-length about 11 mm.*

The first transverse sections through the tooth-band show a labial growth of it at the point where it gives rise to the structure designated by me as  $I_1$ . This growth I have interpreted as a vestigial  $Id_1$ .

There are no traces of other milk-incisors.

The following milk-tooth-germs are related to  $P_1$ ,  $P_2$ , and  $P_4$ .  $Pd_1$  is cup-shaped;  $Pd_2$  is a highly vestigial structure. In  $Pd_4$  the calcification has begun.

*Fœtus: body-length about 13 mm.*

Also at this stage a vestigial trace of  $Id_1$  is distinguishable.  $Pd_1$  and  $Pd_4$  are calcified.

*Young Sorex: body-length about 33 mm.*

$Pd_1$  is present, represented by a minute calcification which will evidently soon be absorbed.

$Pd_4$  is thus the only milk-tooth surely present at birth, all the other upper and lower ones most probably disappearing before birth.

*Summary.*

1. During the foetal life the tooth-band forms a continuous curve in both jaws, the connection of the halves in the middle remaining until a late stage of development, even until calcification has begun in the teeth of both dentitions; in the lower jaw traces of the tooth-band are found even in the young *Sorex*.
2. The most striking feature in *Sorex araneus* is the presence of five incisor-germs in the upper jaw and four in the lower jaw, a greater number than has hitherto been found in any heterodont monodelph. Even if it should not be admitted that the structure  $I^1$ , which is but little differentiated, is a tooth-germ, I think there can be no doubt about the nature of the structure designated by me as  $I^2$  (with the predecessor  $Id^2$ ). The presence of three vestigial incisor-germs in the lower jaw may be considered as proved (*vide* Pl. XIX. figs. 1, 2), though I could not pursue the development of these germs on foetal material.
3. There is in the upper jaw a distinct rudiment of a canine, proving that the ancestors once had such teeth; also in the lower jaw traces of canines are observable.
4. The above facts enable us to homologize the minute antemolar teeth and to ascertain that the number of premolars is complete. It can now hardly be doubted that *Sorex* has four premolars in the upper jaw, and once had the same number in the lower jaw.
5. A milk-dentition is present, consisting of the following teeth:—

$$\frac{Id^2 \quad Id^4 \quad Id^5}{Id_1} \quad \frac{Cd}{Pd_1} \quad \frac{Pd^1 \quad Pd^2 \quad Pd^3 \quad Pd^4}{Pd_1 \quad Pd_2 \quad Pd_1}$$

Some of these tooth-germs calcify, viz. :—

$$\frac{Id^1}{Pd_1} \quad \frac{Pd^1 \quad Pd^2 \quad Pd^4}{Pd_1}$$

6. The milk-dentition is highly reduced and functionless, in all probability disappearing before birth with the exception of the lower  $Pd_1$ , which remains in the young *Sorex*.
7. Besides the milk and permanent series of teeth there is a trace of one more dentition, *i. e.* the prelacteal dentition, a minute growth of the tooth-band having been found on the labial side of  $Id^5$ .



8. The occurrence of lingual buds related to several permanent teeth, and especially to the large incisors in both jaws, shows that there is material enough for producing a postpermanent dentition.
9. The result of the above investigation may be expressed through the following formula:—

$$\begin{array}{ccccccc} I^1 & I^2 & I^3 & I^4 & I^5 & C & P^1 & P^2 & P^3 & P^4 & M^1 & M^2 & M^3 \\ Id^2 & Id^4 & Id^5 & Cd & Pd^1 & Pd^2 & Pd^3 & Pd^4 \\ \hline Id_1 & & & & Pd_1 & Pd_2 & & Pd_4 \\ I_1 & I_2 & I_3 & I_4 & (C) & P_1 & P_2 & (P_3) & P_4 \end{array}$$

The functional set of teeth consists of:—

$$\frac{I^3 \ I^1 \ I^5}{I_1} \quad \frac{P^1 \ P^2 \ P^3 \ P^4}{P_1} \quad \frac{M^1 \ M^2 \ M^3}{M_1 \ M_2 \ M_3}.$$

### NEOMYS (CROSSOPUS) FODIENS.

*The germs of the permanent teeth.*

*Fœtus*: body-length about 17 mm.

*The upper jaw.*

I have not yet been able to procure more than one stage of *Neomys*, and the specimens are rather old.

The tooth-band is continuous as in *Sorex*, the two halves being connected in the middle. The connection with the buccal epithelium is about to be lost.

The part of the tooth-band situated in front of the large functional incisors is well developed, and there is a bud-like swelling on each side, which might be a tooth-germ, in such case probably the homologue of  $I^2$  in *Sorex*. For want of younger fœtal specimens I cannot at present pronounce a definite opinion on this structure.

In *Neomys*, at least at this stage, there is no trace of the anterior swelling found in *Sorex* which I have designated as  $I^1$ .

The large functional first incisor, designated  $I^3$  as the corresponding one in *Sorex*, presents an advanced stage of development, its tooth-germ being bell-shaped. The other two incisors,  $I^4$  and  $I^5$ , are about to pass into the cup-shaped stage.

On the lingual side of  $I^3$  the free deep end of the tooth-band is swollen and bud-like.

There is no trace of a canine in the upper jaw. A distinct germ of this tooth being present in the lower jaw—as will be

shown below—the possibility of the existence of an upper one in younger specimens is not excluded, though it is suppressed in older stages.

I therefore regard the following teeth as premolars, and have designated them  $P^1$ ,  $P^2$ ,  $P^3$ . The first two are represented by large buds, the last one is much in advance and is bell-shaped.

I will call attention to my notation of the premolars being a provisional one.  $P^4$  in *Neomys* is in all probability the homologue of  $P^1$  in *Sorex*, and the teeth called  $P^1$  are probably homologous structures in the two animals. But the material at my disposal does not enable me to decide whether  $P^2$  or  $P^3$  in *Neomys* is suppressed. It seems to me most probable that it is  $P^2$  that remains and  $P^3$  that is suppressed.

This view is based on the fact that in shrews having the full set of premolars  $P^3$  is generally of varying size and sometimes so highly reduced that it has hardly cut the gums. I refer to the excellent figures of several species of *Sorex* and *Blarina*—e. g. *S. personatus*, *S. fumeus*, *S. merriami*, *S. longirostris*; *B. brevicauda*, *B. talmalestes*, *B. carolinensis*—which we owe to Merriam \* and Miller †. One might therefore be inclined to suppose that the final result of the reduction of  $P^3$  may be the total suppression of this tooth in some species.

If it is allowed to presume that the tooth development is the same in different genera of the Soricidae, it is thus  $P^3$  that has been reduced in *Neomys*. But of course only an ontogenetic investigation of younger specimens will make a decisive conclusion possible.

$M^1$  is in advance of the other two molars, being bell-shaped; the free deep end forms a lingual swelling.  $M^2$  is about to become bell-shaped and  $M^3$  is represented by a large swelling of the end of the tooth-band.

#### *The lower jaw.*

The tooth-band is not continuous; it is divided into two halves.

The germ of  $I_4$ —the functional first incisor, which is designated in the same way as the corresponding tooth in

\* Merriam, C. Hart, "Revision of the Shrews of the American Genera *Blarina* and *Notiosorex*," "Synopsis of the American Shrews of the Genus *Sorex*," North American Fauna, no. 10 (Washington, 1895).

† Miller, Gerrit S., Jun., "The Long-tailed Shrews of the Eastern United States," North American Fauna, no. 10 (Washington, 1895).

*Sorex*—is enormous in size and bell-shaped (Pl. XVIII. fig. 2). The free deep end of the tooth-band forms a bud-like swelling on the lingual side. But in front of this tooth there is a well-developed part of the tooth-band, showing two swellings which, seen from the inner side, are distinctly differentiated from the tooth-band (Pl. XVIII. fig. 2). I regard these swellings as germs of two suppressed anterior incisors,  $I_2$  and  $I_1$ , and as probably homologous with the teeth designated in the same way in *Sorex*.  $I_3$  is about to be cup-shaped. Transverse sections through these structures are here figured (text-figs. 7 & 8).

Fig. 7.

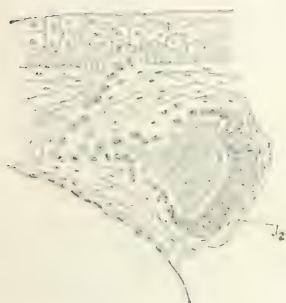


Fig. 8.



*Neomys fodiens*.—Fœtus (17 mm.). Lower jaw. Transverse section, Fig. 7.  $I_2$ . Fig. 8.  $I_3$ .  $\times 220$ . The right side of the figure represents the lingual and the left the labial side of the jaw.

From a comparison with *Sorex araneus* it appears that in *Neomys* a reduction has taken place with respect to the anterior middle part of the tooth-band as well as to the number of the incisors, no trace of  $I_1$  being distinguishable in *Neomys*.

A slight but definite thickening of the tooth-band represents the canine. As there is no such tooth in the upper jaw at this stage, it is probable that the upper canine is more early suppressed than the lower one. In *Sorex* the case seems to be quite the reverse.

On account of the above facts we have to homologize the following four antemolar germs as premolars. The full set of premolars is thus at the fœtal stage present in the lower jaw in *Neomys*, as is the case in the upper jaw in *Sorex*.  $P_1$  and  $P_1$  are well developed, the former being cup-shaped, the latter bell-shaped. The free deep end of the tooth-band is

swollen on the lingual side of  $P_1$ .  $P_2$  and  $P_3$  are represented by two bud-like swellings of the tooth-band (Pl. XVIII. fig. 2).

What is said about the molars in the upper jaw is also true about the molars in the lower jaw, only that  $M_2$  is somewhat more differentiated.

#### *The milk-teeth.*

The milk-dentition is highly reduced and retarded in its development. It may be doubted if any of the milk-teeth calcify, and probably none of them cut the gums.

#### *The upper jaw.*

There are two milk-incisors, viz.  $Id^4$  and  $Id^5$ ; the former is a bud-like rudiment, the latter is cup-shaped. I have found no trace of a prelaeteal dentition in connection with  $I$  in *Neomys*.

Predecessors of the three premolars have also been found, viz.  $Pd^1$ ,  $Pd^2$ , and  $Pd^4$ .  $Pd^2$  is cup-shaped, the other two are represented by bud-like structures.

#### *The lower jaw.*

There are no predecessors of the incisors in the lower jaw, but vestigial predecessors of the other antemolars have been found, viz.  $Cd$ ,  $Pd_1$ ,  $Pd_2$ , ( $Pd_3$ ),  $Pd_4$  (Pl. XVIII. fig. 2). The remainder of  $Pd_3$  consists only of a few epithelial cells.

#### *Summary.*

1. The tooth-band is continuous in the upper jaw, the connection in the middle remaining. In the lower jaw the tooth-band is divided into two halves.
2. There are most probably four incisor-germs in the upper jaw. If this is true, the number of incisors is greater than in any other monodelph with the exception of *Sorex araneus*.
3. In the lower jaw there are germs of eight antemolars. In front of the large incisor there are rudiments of two suppressed teeth, which proves that the ancestors of *Neomys* once had three incisors in the lower jaw.
4. A rudimentary canine is present in the lower jaw.
5. Rudiments of two suppressed lower premolars,  $P_2$  and  $P_3$ , are present. It is thus proved that the full set of premolars once existed.



6. There are two dentitions in *Neomys fodiens*, the milk and permanent dentitions. The former is reduced and functionless. The milk-teeth are probably never developed, and disappear in all probability before birth. As in *Sorex*, the possibility of a postpermanent dentition is not excluded.
7. The results of the tooth-development in *Neomys fodiens* may be thus expressed:—

$$\begin{array}{cccccccccccc}
 (I^2) & I^3 & I^4 & I^5 & — & P^1 & P^2 & — & P^4 & M^1 & M^2 & M^3 \\
 & Id^1 & Id^5 & — & Pd^1 & Pd^2 & — & Pd^4 & & & & \\
 \hline
 & & & & Cd & Pd_1 & Pd_2 & (Pd_3) & Pd_4 & & & \\
 I_2 & I_3 & I_4 & & C & P_1 & P_2 & P_3 & P_4 & M_1 & M_2 & M_3.
 \end{array}$$

The functional set of teeth consists of:—

$$\frac{I^3 \ I^4 \ I^5}{I_1} \quad \frac{P^1 \ P^2 \ P^4}{P_1 \ P_4} \quad \frac{M^1 \ M^2 \ M^3}{M_1 \ M_2 \ M_3}.$$

### CROCIDURA RUSSULA.

#### *The germs of the permanent dentition.*

As already mentioned, I have examined five foetal specimens. Though not varying much in size, they represent three stages of development of the teeth—I., II., III.

#### *The upper jaw.*

In the specimens representing stages I.—II. the tooth-band is continuous, but its anterior part, in front of  $I^3$ , is highly reduced.

In the specimen representing stage III. the anterior part is about to be absorbed, which is also true of the buds situated on the lingual side of several teeth.

In the specimens examined I have found no definite trace of reduced anterior incisors. In this respect *Crocidura* differs from *Sorex* (and *Neomys*). These tooth-rudiments seem to have been totally suppressed in *Crocidura*.

As to  $I^3$ , a layer of dentine has been formed.  $I^4$  is in the bell-shaped stage. The development of  $I^5$  is retarded; it is in all three stages represented by a thickening of the tooth-band.

There is no trace of a canine.

The two other functional teeth ought in all probability to be regarded as  $P^1$  and  $P^4$ . The tooth-germ of  $P^1$  is bud-shaped in all the three stages, and consequently retarded in

its development. How highly  $P^1$  is in advance of  $P^3$  in size is shown by the reconstruction figure (Pl. XVIII. fig. 3).

In the youngest specimens there is between  $P^1$  and  $P^4$  a thickening of the tooth-band, no doubt representing  $P^2$ , which, as a rule, is suppressed in the adult animal, but in rare cases is developed\*.

As to the notation of the premolars, I refer to what is said above about the notation of the corresponding teeth in *Neomys*.

In stage III.  $M^1$  is about to be calcified;  $M^2$  and  $M^3$  are bell-shaped.

*The lower jaw.*

The tooth-band is divided into two halves not connected in the middle. The tooth-band between the teeth, though reduced, is distinguishable.

There is no definite trace of a suppressed  $I_2$  or  $I_3$ , but I have observed that in front of  $I_1$ —the large procumbent incisor—the buccal epithelium forms two not very deep rather broad ingrowths in front of the germ of the last-mentioned tooth. How these ingrowths are to be interpreted, whether they are remains of the tooth-band or not, may be an open question. By the examination of younger foetal specimens this point may possibly be decided.

The large functional incisor, being in all probability homologous with the corresponding large teeth in *Sorex* and *Neomys*, is designated in the same way as these, *i. e.*  $I_1$ . This tooth is about to calcify. The free deep end of the tooth-band is swollen on the lingual side.

I have found no trace of a canine.  $P_1$  and  $P_4$  are in the bell shaped stage, and on the lingual side of these two teeth the free deep end of the tooth-band is swollen.

In stage I. a rudiment of  $P_2$ , still more vestigial than in *Sorex* and *Neomys*, is distinguishable; in stages II. and III. it is already absorbed.

Of  $P_3$  no trace can be seen.

The lower molars have reached the same degree of development as the upper ones, *i. e.* in  $M_1$  the calcification has begun;  $M_2$  and  $M_3$  have the bell-shaped form.

It should be especially pointed out that there is a gap between the lower  $P_1$  and  $M_1$  and that the tooth-band shows a distinct swelling between these teeth, suggesting the possible presence of the last trace of a suppressed tooth.

\* Dobson, G. E., 'A Monograph of the Insectivora, Systematic and Anatomical,' part iii. fasc. 1 (London, 1890).

This is not the only case in which a tooth-germ occurs in this place.

In *Erinaceus europæus*\* a cup-shaped tooth-rudiment is found behind  $Pd_4$  in the lower jaw.

*The milk-teeth.*

*The upper jaw.*

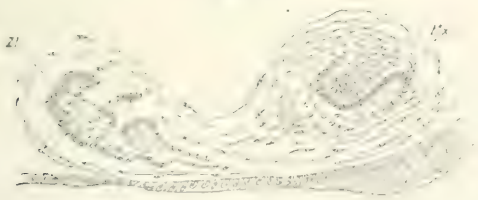
In stage I. some vestigial milk-teeth are present, viz.  $Id^1$ ,  $Pd^1$ , and  $Pd^4$ . The first-mentioned milk-tooth is about to be absorbed. The two others are cup-shaped (Pl. XVIII. fig. 3).  $Pd^1$  is less reduced and is still connected with the tooth-band (Pl. XVIII. fig. 3).

I have found no predecessor of  $I^3$ .

The predecessor of  $I^3$ , which is present in both *Sorex* and *Neomys*, has disappeared in *Crocidura russula*, at least in the stages in question.

Of the greatest interest is, however, the occurrence of another tooth-rudiment— $Mx$ —situated between  $P^4$  and  $M^1$  on the labial side of the tooth-band like the milk-teeth, belonging no doubt to the milk-dentition (text-fig. 9). As will be seen from the reconstruction figure, this tooth-germ is not related to the preceding  $P^1$  nor to the following  $M^1$  (Pl. XVIII. fig. 3).

Fig. 9.



*Crocidura russula*.—Fœtus ( $12\frac{1}{2}$  mm.). Upper jaw. Transverse section.  $Mx$ , tooth-germ belonging to the milk-dentition;  $Zl$ , tooth-band.  $\times 220$ . The left side of the figure represents the lingual, the right the labial side of the jaw.

If it were regarded as a predecessor of  $M^1$  this tooth would be a premolar, a supposition which—if we agree in the most probable view that  $P^1$  in *Crocidura* is the homologue of  $P^1$  in *Sorex* (and *Neomys*)—would involve that *Crocidura*, or, rather, its ancestors, once had five premolars.

\* Leche, W., *l. c.* p. 23, pl. iii. figs 18 & 19.

The supposition that the tooth-rudiment in question would represent the predecessor of a suppressed premolar involves the same consequence.

But as yet nothing is known of a mammal belonging to the Cainozoic age with more than four premolars, and the same number is also typical of the hypothetical ancestors of the Insectivores.

As thus the tooth-germ Mx can hardly be regarded as a premolar, it must, of course, be a molar-rudiment. In the following I will give further reasons for this view.

The tooth-germ Mx has been found on both sides in the upper jaw in both the examined specimens of stage I.

In stage II. only Pd<sup>1</sup> remains, also the tooth-rudiment Mx has vanished, but the tooth-band between P<sup>1</sup> and M<sup>1</sup> is swollen.

In stage III. all the tooth-rudiments have disappeared except a few cells of Pd<sup>1</sup>, which remain on one side.

#### *The lower jaw.*

Highly vestigial traces of Pd<sub>1</sub>, Pd<sub>2</sub>, and Pd<sub>4</sub> are present in stage I. They are about to be absorbed.

In stage II. there is a remainder of Pd<sub>4</sub>, but in stage III. every trace of the milk-dentition has disappeared. Thus the milk-teeth in both jaws do not calcify and are all absorbed before birth.

#### *Summary.*

1. The tooth-band is continuous in the upper jaw, though highly reduced in the middle; it is divided into two halves in the lower jaw, as in *Neomys fodiens*.
2. There are no rudiments of suppressed upper teeth in front of the large incisors; in this *Crociodura* differs from *Sorex* (and also probably from *Neomys*).
3. I<sup>5</sup>—the functional third incisor—is retarded in its development, and has lost its predecessor in the milk-dentition.
4. P<sup>1</sup> is retarded in its development.
5. The upper P<sup>2</sup> is present in the youngest stage, but has lost its predecessor in the milk-dentition.
6. There are no definite traces of suppressed teeth in front of the large incisors in the lower jaw.
7. A vestigial trace of the lower P<sub>2</sub> has been found.



8. The presence of a highly rudimentary milk-dentition is ascertained. The milk-teeth do not calcify and are resorbed before birth.
9. A rudimentary tooth-germ situated between the upper  $P^1$  and  $M^1$ , belonging to the milk-dentition and probably representing a suppressed molar, is present.
10. The result of the tooth-development in *Crocidura russula* may be expressed through the following formula:—

$$\begin{array}{ccccccc}
 I^3 & I^1 & I^2 & P^1 & P^2 & P^3 & M_X & M^1 & M^2 & M^3 \\
 Id^1 & & & Pd^1 & & Pd^1 & & & & \\
 & & & Pd_1 & Pd_2 & Pd_1 & & & & \\
 I_1 & & & P_1 & P_2 & P_1 & — & M_1 & M_2 & M_3.
 \end{array}$$

The functional set of teeth consists of:—

$$\begin{array}{ccccccc}
 I^3 & I^1 & I^2 & P^1 & & P^1 & M^1 & M^2 & M^3 \\
 I_1 & & & P_1 & — & P_1 & M_1 & M_2 & M_3.
 \end{array}$$

*Fœtal specimen of a Shrew (Crocidura), body-length about 10 mm.*

In the collection of microscopic preparations of the Zoological Institute of the University in Stockholm there are serial sections through the head of a fœtal shrew, labelled as *Neomys fodiens*. By a comparison with my own preparations I have come to the conclusion that the object is not a *Neomys*, but probably a *Crocidura*, with which animal it agrees above all with respect to the teeth in all essential points.

The tooth-band is continuous in the upper jaw, but divided into two halves in the lower.

In neither jaw did I find any traces of suppressed incisors in front of the functional large ones.

The examination of this fœtus confirms the aforesaid result that there are two dentitions in the Soricidæ.

The teeth are not very much differentiated, which was to be expected. On the labial side of the tooth-band the cup-shaped germs of the milk-teeth are to be seen, and on the lingual side the bud-like germs of the permanent teeth are situated.

The germs of  $I^3$  and  $P^1$  in the upper jaw and those of  $I_1$  and  $P_1$  in the lower jaw are in advance of the other teeth and are cup-shaped.

In this fœtal specimen, the youngest at my disposal, a predecessor of  $I_1$ —the large procumbent incisor—is present. Thus, by the presence of  $Id_1$  it is established that the large

functional lower incisors belong to the permanent dentition. This fact seems to justify the conclusion that also the first pair of upper incisors belong to the same dentition.

In this specimen Id<sup>5</sup>, which was absent in the stages described above of *Crocilura russula*, is present in the upper jaw.

### Results.

The chief facts ascertained by my investigation, illustrating the descent of the Soricidæ and their relation to the other Insectivores, are the following :—

1. The presence of more than three incisor-germs in both jaws of *Sorex araneus*, and probably also in the upper jaw of *Neomys*.
2. The presence of a tooth-rudiment belonging to the milk-dentition situated between the upper P<sup>1</sup> and M<sup>1</sup> in *Crocilura russula*.
3. The presence of other rudimentary antemolars, proving that the Soricidæ once had a full set of permanent teeth.
4. The presence of a rudimentary milk-dentition in the three genera *Sorex*, *Neomys*, and *Crocilura*.

The germs of I<sup>1</sup> and I<sup>2</sup> in the upper jaw and that of I<sub>1</sub> in the lower jaw are to be regarded as rudimentary organs without any function. They are present in fetal specimens, and disappear afterwards without attaining full development. They are undoubtedly inherited from distant ancestors, *which consequently were to be found among polyprotodont (and heterodont) mammals*.

As is well known, the Mesozoic Mammalia—I think especially of the Trituberculata, Osborn, which are regarded by Osborn and several other zoologists as the ancestors of the Insectivores—were characterized by polyprotodonty and heterodonty. Yet no certain form among them can be pointed to as progenitor of the Soricidæ. So far as I know, no intermediate forms have been found between the Soricidæ, with their enormously developed anterior incisors and their want of canines, and the Mesozoic mammals, with their but little specialized incisors and their highly differentiated canines. But this may be due to the fact that the fossil finds of Mesozoic mammals are very few in number and consist only of incomplete fragments. Several lower jaws

have been found, but the fragments of the upper jaws are rather spare.

However, the most important result of this investigation is that the vast gap which has hitherto existed, with regard to the number of incisors, between the polyprotodont Mammalia—the Marsupialia included—and the Monodelphia is now bridged over; for by this investigation the existence of intermediate forms has been shown, germs of more than three incisors having been found in monodelphic heterodont mammals: *Soricidæ*.

Among now living Mammalia the Marsupialia alone are characterized by polyprotodonty and heterodonty. But in my opinion these points of agreement do not warrant the conclusion that the *Soricidæ* are descended from now living Marsupialia\*.

The said points of agreement—and possibly others too—seem to me rather to argue in favour of the view that the *Soricidæ* and the Marsupialia have a common origin.

With respect to the tooth-rudiment Mx found in *Crociodura russula* I have already pointed out that it can hardly be regarded as a premolar, because such a view would involve the supposition that a progenitor once existed having a greater number of premolars than the known recent and Mesozoic mammals have.

It is true that in two genera, *Amphitherium* and *Peramus*, the number of premolars exceeds four, but they are regarded by Osborn† as exceptions: “The almost invariable presence of four premolars among the Mesozoic and recent mammals is a very difficult fact to explain. This genus [*Peramus*] and apparently *Amphitherium* are among the few exceptions.”

In support of an opposite opinion, *i. e.* that the tooth-germ Mx is a molar, the following facts may be alleged:—

1. A tooth-rudiment evidently belonging to the milk-dentition has been found, but no trace of a successor is distinguishable. All the permanent teeth are, however, already differentiated.
2. In the Mesozoic mammals the number of molars surely exceeded three. If really the ancestors of the *Soricidæ*

\* Ziehen, “Das Centralnervensystem der Monotremen und Marsupialier,” p. 175: Denkschriften der Med.-naturw. Gesellschaft zu Jena, Bd. iii. T. 1 (1897).

† Osborn, H. F., “Additional Observations upon the Structure and Classification of the Mesozoic Mammals,” Proc. Acad. Nat. Sci. Philadelphia, 1888, p. 296.

are to be found among them, the presence of supernumerary molars would not be unlikely, but must, on the contrary, be expected; as already mentioned, traces of polyprotodenty have been found.

3. In some living mammals the number of four molars is a rule. So it is in the Marsupialia, at least according to the general view.

In an Insectivore, *Centetes ecaudatus*, the presence of four molars is quite normal\*.

I only mention this fact without entering into a discussion upon the homology of the teeth.

4. In the literature I have found mentioned by Leche† one instance of an Insectivore, *Erinaceus micropus*, having a fully developed tooth (Px) situated between P<sup>4</sup> and M<sup>1</sup> in the upper jaw. Having stated that in *Erinaceus europæus* the free deep end of the tooth-band is swollen like a bud on the lingual side of P<sup>4</sup> (l. c. fig. 55), the author concludes that the tooth Px in *Erinaceus micropus* has been developed from such a lingual bud, and that, consequently, this tooth is a fully developed premolar belonging to the postpermanent dentition, atavism being out of the question.

I cannot agree to this view. The presence of such lingual buds does not necessarily prove that they will be developed into functional teeth. So far as I know, the literature does not mention any satisfactory ontogenetic evidence of such a development of heterodont mammalian teeth. In general these buds are early absorbed; this is the case in the Soricidæ and, according to Leche, also in *Erinaceus europæus*.

As to the ontogeny of the tooth Px in question we know nothing at all. Though the possibility of its belonging to the postpermanent dentition cannot be denied, it is, however, highly improbable; at all events it is not proved.

Another interpretation is possible, viz. that Px in *Erinaceus micropus* and Mx in *Crocidura russula* are homologous. If thus the germ Mx could develop into such a tooth as Px, and, *vice versa*, if Px has been developed from such a germ as Mx, both these structures are no doubt molars. The

\* Thomas, O., "On the Insectivorous Genus *Echinops*, Martin, with Notes on the Dentition of the Allied Genera," Proc. Zool. Soc. London, 1892; Dobson, G. E., 'A Monograph of the Insectivora, Systematic and Anatomical,' part i. (London, 1882).

† Leche, W., l. c. p. 43, text-fig. 8, p. 154.



presence of these teeth would consequently be an instance of atavism.

Whether the tooth-rudiment Mx in *Crocidura russula* is a molar or premolar must, however, be left undecided. At all events, *the presence of this tooth-germ leads us back to the Mesozoic mammals*, which have a greater number of molars (and premolars) than now living heterodont mammals (with the exception of *Myrmecobius*).

In this connection it may be pointed out that if it could be definitely shown that Mx (which tooth-rudiment evidently belongs to the same dentition as the milk-premolars, and has probably been absorbed at the same time as these teeth) is a suppressed molar, then the view that the molars belong to the milk-dentition is fully confirmed.

As has been shown above, the genus *Sorex* in its adult stage has the full set of premolars in the upper jaw. In the lower jaw a complete set of these teeth is never present, all known Soricidæ, with the exception of one species, having only two lower premolars. But, as appears from the above, the Soricidæ surely once had four premolars also in the lower jaw. This seems to be confirmed by paleontological evidence. In *Protosorex crassus* Scott\* has shown the presence of four minute teeth between the molars and the large procumbent incisors. The first and the fourth are larger than the other two. Unfortunately he gives no figure of them and expresses no opinion as to their homology.

Comparing Scott's description with the result of my investigation, I daresay that *the four minute teeth in question in Protosorex crassus in all probability represent the four premolars*.

In *Myosorex varius* Dobson† has pointed out the presence of a rudimentary minute tooth situated between the second and the third lower teeth, which he regards as a probable canine, thus existing in a single species.

As a result of my investigation I venture to maintain that *this tooth is not a canine, but that it is the second premolar*, which remains, though in a rudimentary condition, in the adult *Myosorex varius*, but in *Sorex*, *Neomys*, and *Crocidura* is found only in fœtal specimens.

\* Scott, W. B., "A new Insectivore from the White River Beds," Proc. Acad. Nat. Sci. Philadelphia, vol. xvi. (1894).

† Dobson, G. E., l. c. 1890, part iii. fasc. 1; "Mandibular Dentition of the Shrews," Journ. Anat. Physiol. vol. xx. (1885-86).

*Myosorex varius* is thus the only living shrew which has three premolars in the lower jaw.

My investigation has put beyond a doubt that the Soricidæ have two dentitions, the permanent and milk dentitions. Besides these dentitions traces of a third, *i. e.* a prelacteal dentition, have been found in *Sorex araneus*.

Comparing the three genera examined—*Sorex*, *Neomys*, *Crociodura*—with each other, we find that as regards the tooth-development they form a series, *Sorex* being the most primitive and *Crociodura* the most advanced form, *Neomys* holding an intermediate position.

In conclusion, it may be asserted that the results of this investigation are also applicable to such other Insectivores as are genetically connected with the Soricidæ, and that they are of importance not only with regard to the order Insectivora, but also to the subclass Monodelphia, as I have shown that the Soricidæ are with respect to the teeth to be regarded as intermediate forms between the polyprotodont mammals—the Marsupialia included—and the Monodelphia.

## EXPLANATION OF THE PLATES.

### PLATE XVIII.

- Fig. 1. Sorex araneus.* Fœtus (11 mm.). Upper jaw. Tooth-band and germs of all antemolars in the left half of the jaw (except the canine), and germs of the first three incisors in the right half of the jaw and milk predecessors. Reconstruction of the ectodermal parts. *Ek*, ectoderm; *Zl*, the swollen free deep end of the tooth-band on the lingual side of  $I^3$ . A dotted line shows the corresponding structure on the other side. The tooth-germs of the left half of the jaw are seen from the labial, those of the right half from the lingual side of the jaw.  $\times 70$ .
- Fig. 2. Neomys fodiens.* Fœtus (17 mm.). Lower jaw. Tooth-band and germs of all antemolars in the left half of the jaw, with milk predecessors. Reconstruction of the ectodermal parts. *Ek*, ectoderm; *Zl* (upper), labial ledge; *Zl* (lower), the swollen free deep end of the tooth-band on the lingual side of  $I_4$ . (Part of  $I_4$  has been removed to show the germs of  $I_2$  and  $I_3$  and the swollen free deep end of the tooth-band.) The tooth-germs are seen from the labial side of the jaw.  $\times 70$ .
- Fig. 3. Crociodura russula.* Fœtus ( $12\frac{1}{2}$  mm., stage I.). Upper jaw. Tooth-band and germs of the premolars and the first molar in the left half of the jaw and milk predecessors. Reconstruction of the ectodermal parts. *Ek*, ectoderm; *Mr*, tooth-germ belonging to the milk-dentition. The tooth-germs are seen from the labial side of the jaw.  $\times 70$ .

## PLATE XIX.

Figs. 1, 2. Young *Sorex* (33 mm.). Lower jaw. Transverse sections, showing the rudiments of the anterior incisors  $I_1$ ,  $I_2$ ,  $I_3$ .  $Zl$ , tooth-band.  $\times$  about 200. The right side of the figure represents the lingual and the left the labial side of the jaw.

LXVII.—*Descriptions of new Species of Pyralidæ of the Sub-family Pyraustinae.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from p. 444.]

(51 c) *Nacoleia attenualis*, sp. n.

Head and thorax yellowish white; palpi above and lower part of frons brown; fore tibiæ with black band at extremity; abdomen very long, yellowish white with slight dorsal brown bands; claspers and anal tuft very long and rufous at extremity. Fore wing long and narrow, yellowish white, the costa slightly expanded at base and tinged with brown; a subbasal dark point on inner margin; antemedial line brown, rather strong, oblique from costa to middle of cell, then erect; a double brown discoidal bar with whitish centre; postmedial line brown, rather strong, very slightly incurved at discal fold, at vein 2 retracted to lower angle of cell, then curved inwards to inner margin near antemedial line; a terminal brown line. Hind wing yellowish white; a brown discoidal bar with line from it to inner margin above tornus; postmedial line slightly bent outwards between veins 5 and 2 where it terminates; a rather strong terminal brown line.

*Hab.* BR. E. AFRICA (*Gregory*), 2 ♂ type, Mombasa (*Cholmley*), 1 ♀, Taveta (*Rogers*), 1 ♀. *Exp.* 20 mm.

(53 a) *Nacoleia stenialis*, sp. n.

Fore wing with the apex produced and acute, the termen slightly excised below it.

♂. Head and thorax white mixed with some reddish brown, the metathorax suffused with red-brown; palpi red-brown above; fore tibiæ with brown band at extremity; abdomen very elongate, white dorsally tinged with red-brown especially at base. Fore wing yellowish white, the costal area suffused with red-brown, the terminal area rather

broadly tinged with brown from apex to vein 3; a slight discoidal striga; a faint postmedial line excurved from costa to vein 5, then oblique. Hind wing semihyaline yellowish white, the apex slightly tinged with brown.

*Hab.* PERU, Huancabamba, 1 ♂ type. *Exp.* 34 mm.

(57 a) *Nacoleia ommatalis*, sp. n.

Antennæ of male laminate.

♂. Head and thorax yellowish white suffused with brown; palpi brown, white at base; pectus, legs, and abdomen yellowish white. Fore wing yellowish white; the basal area suffused with brown and irrorated with a few silvery scales; brown spots in middle of cell and on discocellulars with some silvery scales on them; a brown line from vein 8 beyond the cell curved downwards below end of cell, then upwards to median nervure between the spots, then sinuous to vein 1 before middle; a fine postmedial line arising from vein 8, excurved at vein 7, angled inwards at vein 5, excurved and obsolescent to vein 2, then incurved; the apical area suffused with brown to vein 3, leaving a pale patch on termen between veins 6 and 4; a slight dark terminal line. Hind wing yellowish white; a small black discoidal spot; a fine dark postmedial line excurved and obsolescent between veins 5 and 2 and ending on inner margin just above tornus; a rather diffused dark line from just below apex to termen at vein 3, expanding into a spot in discal fold; a subterminal spot below vein 2.

*Hab.* BR. E. AFRICA, Takaunga (*Thomas*), 1 ♂ type; TRANSVAAL, White R. (*Cooke*), 1 ♀. *Exp.*, ♂ 22, ♀ 26 mm.

(62 a) *Nacoleia chromalis*, sp. n.

♀. Head and thorax pale yellow; abdomen yellowish white. Fore wing very pale yellow, the costal area faintly tinged with fulvous; antemedial line very indistinct, oblique from costa to submedian fold, where there is a dark point, then erect; a faint dark point in middle of cell and small discoidal spot; postmedial line slight, punctiform, incurved below costa, excurved between veins 5 and 2, then retracted to below angle of cell and erect to inner margin. Hind wing very pale yellow; a black discoidal point; postmedial line slight, punctiform, incurved below costa, bent outwards between veins 5 and 2, then retracted to below angle of cell and again slightly excurved.

*Hab.* BALI (*Doherty*), 1 ♀ type. *Exp.* 20 mm.



(64c) *Nacoleia retractalis*, sp. n.

*Idolyptea dircealis*, Druce, Biol. Centr.-Am., Het. p. 258 (part.), nec Wlk.

Head, thorax, and abdomen ochreous yellow tinged with rufous; pectus and legs white, the fore tibiae and tarsi banded with fuscous; abdomen with white segmental lines, defined behind by fuscous towards extremity, the ventral surface white. Fore wing ochreous yellow tinged with rufous; a fuscous subbasal line, slightly angled outwards below costa, then oblique to inner margin; antemedial line fuscous, oblique and slightly excurved; a minute fuscous annulus in middle of cell, and elliptical discoidal annulus; postmedial line fuscous, excurved from below costa to vein 2, then retracted to just below angle of cell and again excurved; a fuscous terminal line; cilia whitish with a fuscous line through them. Hind wing ochreous yellow tinged with rufous; a fuscous discoidal bar; postmedial line fuscous, slightly incurved below costa, oblique to vein 2, then retracted to the discoidal bar, oblique to above tornus and bent inwards to inner margin; a fuscous terminal line; cilia with fuscous line at middle and white tips; the under-side whitish with the markings indistinct.

*Hab.* Mexico, Teapa, Tabasco (*H. H. Smith*), 1 ♂, 1 ♀ type, Godman-Salvin Coll. *Exp.* 18 mm.

(65a) *Nacoleia terminalis*, sp. n.

♂. Ochreous white; palpi except at base, head, and tegulae mostly black; tibiae with black spots; abdomen with paired dorsal black points at base, larger spots on third segment, and yellow-brown bands on terminal segments. Fore wing with some black and brown markings at base of costa and a series of black points on the costa; faint traces of an antemedial line and discoidal spot; the postmedial line minutely dentate, bent inwards in discal fold, excurved to vein 2, then almost obsolete and retracted to below end of cell; a large black-brown patch on termen from below apex to vein 3 and another at tornus; a terminal series of black striae and some spots on termen. Hind wing with discoidal black point; the postmedial line dentate, bent inwards in discal fold, excurved to vein 2, then retracted to below end of cell and obsolescent, distinct again towards inner margin; traces of a waved subterminal line; black-brown patches at apex and tornus and a series of black terminal striae.

*Hab.* JAMAICA, Holly Mt. (*Taylor*), Newcastle, 1 ♂ type. *Exp.* 22 mm.

(70 a) *Nacoleia leucophæa*, sp. n.

*Epichronistis dadalis*, Druce, Biol. Centr.-Am., Het. ii. p. 559 (part.).

Head and tegulae fuscous brown; thorax white slightly tinged with ochreous; palpi white at base; pectus and legs white, the fore tibiae with fuscous bands; abdomen white, the extremity brown above. Fore wing white, the costal and terminal areas fuscous brown; a curved brown antemedial line from the costal area to inner margin; a small dark spot at middle of cell and discoidal lunule conjoined to the dark costal area; postmedial line brown, straight to vein 3, then bent inwards and erect to inner margin; cilia with ochreous-white line at base. Hind wing white; a small dark discoidal spot; postmedial line brown, oblique, slightly excurved at middle; the termen brown, slightly diffused at apex; cilia with a brown line near base.

*Hab.* PANAMA, Chiriqui (*Champion*), 1 ♂, 1 ♀ type, Godman-Salvin Coll. *Exp.* 26 mm.

(70 c) *Nacoleia indentata*, sp. n.

*Epichronistis dadalis*, Druce, Biol. Centr.-Am., Het. ii. p. 258 (part.).

♀. Head and thorax white tinged with ochreous; palpi blackish, white at base; fore tibiae with blackish band; abdomen white tinged with reddish ochreous. Fore wing white, the costal and terminal areas fuscous brown; a slight oblique brown antemedial line from the costal area to above inner margin; a blackish point at middle of cell and discoidal lunule; postmedial line fuscous brown, excurved from below costa to vein 3, where it is angled inwards, angled outwards below vein 3, then retracted to below end of cell, and again angled outwards above vein 1; cilia with a fine whitish line at base followed by a dark line. Hind wing white; an oblique dark discoidal bar; postmedial line fuscous brown, incurved below costa, slightly angled inwards below vein 3, retracted below vein 2 to below end of cell, then slightly excurved; a terminal brown line from apex to vein 1, rather diffused on apical area; cilia with a fine brown line near base.

*Hab.* COSTA RICA, Candelaria Mts. (*Underwood*), 1 ♀ type, Godman-Salvin Coll. *Exp.* 34 mm.

(71 a) *Nacoleia stramineata*, sp. n.

*Blepharomastix vilialis*, Druce, Biol. Centr.-Am., Het. ii. p. 561 (nec Guen.).

. . Head, thorax, and abdomen ochreous white; neck and

shoulders dark brown; palpi white, blackish at tips; fore tibiae with blackish band at extremity; abdomen with subdorsal blackish spots on third segment. Fore wing ochreous white, the costal and terminal areas suffused with brown; an oblique slightly curved antemedial fuscous line; a black discoidal bar; postmedial line fuscous, excurved between veins 5 and 2, then retracted to below end of cell and erect to inner margin; cilia with a fine whitish line at base and the tips whitish. Hind wing ochreous white, the terminal area tinged with brown; a black discoidal striga; postmedial line fuscous, slightly bent outwards between veins 5 and 2, then retracted to below end of cell, and oblique to above tornus; a fuscous terminal line and line near base of cilia.

*Hab.* MEXICO, Tabasco, Teapa (*H. H. Smith*), 1 ♀ type, Godman-Salvin Coll. *Exp.* 22 mm.

(73 a) *Nacoleia inflexalis*, sp. n.

*Blepharomastix colubralis*, Druce, Biol. Centr.-Am., Het. ii. p. 268 (part.), nec Guen.

♂. Head and thorax white, the head and dorsum of thorax tinged with reddish ochreous; palpi blackish, white at base; abdomen white, with dorsal cupreous-brown lines on second and fifth segments. Fore wing white, the costa suffused with reddish brown; a slight reddish-brown antemedial line, excurved from the costal area to vein 1; a small brown annulus at middle of cell conjoined to the brown costal area; a discoidal bar defined by brown and with white centre; postmedial line brown, incurved below costa, then straight to vein 2, then almost obsolete and retracted to lower angle of cell and oblique to inner margin; a black-brown terminal line. Hind wing white; an oblique brown discoidal striga; postmedial line brown, oblique and sinuous to vein 2 just before termen, then almost obsolete and retracted to the discoidal bar and oblique to inner margin; a fine terminal black-brown line.

*Hab.* MEXICO, Guerrero, Omilteme (*H. H. Smith*), 1 ♂ type, Godman-Salvin Coll. *Exp.* 24 mm.

(76 a) *Nacoleia apertisigna*, sp. n.

*Blepharomastix terricolaris*, Druce, Biol. Centr.-Am., Het. ii. p. 269 (part.), nec Möschl.

♀. Head, thorax, and abdomen pale reddish brown suffused with fuscous; palpi blackish, white at base; pectus, mid and hind tibiae and tarsi, and ventral surface of abdomen white. Fore wing pale reddish brown thickly irrorated with

fuscous; an oblique slightly sinuous fuscous antemedial line; orbicular and reniform stigmata defined by fuscous except above, the latter bar-shaped; postmedial line fuscous, slightly excurved below costa and incurved at discal fold, excurved to vein 2 towards termen, then retracted to below angle of cell and excurved above inner margin; a terminal series of small black spots; cilia greyish fuscous with a fine pale line at base. Hind wing pale reddish brown thickly irrorated with fuscous; an oblique blackish discoidal bar; postmedial line fuscous, excurved between veins 5 and 2, then retracted to the discoidal bar and oblique to tornus; a blackish terminal line and line near base of cilia, which are whitish at tips.

*Hab.* MEXICO, Jalapa (*Trujillo*), 1 ♀ type, Godman-Salvin Coll. *Exp.* 22 mm.

(83 b) *Nacoleia euryphæalis*, sp. n.

Head and thorax yellow, almost entirely suffused with fuscous brown; palpi black, white below; antennæ ringed with black; abdomen yellow, tinged with brown towards extremity; throat white; pectus, legs, and ventral surface of abdomen whitish, the fore coxæ and femora black in front, the tibiæ and first joint of tarsi with black bands. Fore wing yellow; a diffused fuscous-brown patch on base of costa extending almost to inner margin; a medial patch on costa with the antemedial line from its inner edge to inner margin; a yellow discoidal lunule defined by fuscous brown and confluent with a patch on costa; the terminal half of costa with alternating black and yellow spots; postmedial line fuscous brown, excurved between veins 5 and 2, then retracted to below end of cell and slightly excurved at vein 1, a fuscous-brown patch beyond it on inner area and the terminal area fuscous brown except towards tornus; a terminal series of black points; cilia yellow with some fuscous at middle. Hind wing yellow; a black discoidal point; postmedial line blackish, excurved between veins 5 and 2, then retracted to below end of cell and rather diffused on inner area, the area beyond it fuscous brown except towards tornus; a terminal series of blackish points; cilia yellow with some fuscous at middle.

*Hab.* N. GUINEA, Milne Bay (*Meek*), 1 ♂, 1 ♀ type. *Exp.* 14 mm.

(83 c) *Nacoleia disemalis*, sp. n.

Head, thorax, and abdomen yellow mixed with red-brown;



palpi black, white at base ; pectus, legs, and ventral surface of abdomen white, the fore tibiæ with fuscous band. Fore wing yellow ; a small black spot at base of costa and diffused subbasal fuscous bar from costa to median nervure ; a curved maculate blackish antemedial line ; a small spot in middle of cell defined by blackish and double blackish discoidal bar ; some blackish spots on terminal half of costa ; postmedial line dark brown, arising from costa towards apex, slightly angled outwards below costa and oblique to discal fold, erect to vein 2, then almost obsolete and retracted to below end of cell and erect to inner margin ; a terminal blackish line somewhat diffused, especially towards apex ; cilia fuscous with a punctiform whitish line at base. Hind wing yellow, the terminal area more or less suffused with red-brown ; a small dark discoidal spot ; postmedial line dark brown, punctiform, excurved between veins 5 and 2, then retracted to below end of cell and oblique to inner margin ; a dark terminal line ; cilia fuscous with a punctiform whitish line at base.

*Hab.* BORNEO, Kuching (*Shelford*), 2 ♂, 2 ♀ type. *Esp.* 14 mm.

(84a) *Nacoleia melaprocta*, sp. n.

♂. Head, thorax, and abdomen yellow, the head and thorax with black mixed, the abdomen with blackish segmental lines on basal segments and black bar near extremity, and the anal segment black with yellow dorsal streak ; palpi fuscous, whitish at tips ; pectus, legs, and ventral surface of abdomen whitish, the fore tibiæ with fuscous band. Fore wing yellow ; two blackish subbasal bars from costa ; antemedial line black, slightly sinuous, a blackish spot beyond it below the cell ; black annuli in middle of cell and on discocellulars ; two black annuli with slight pale centres on middle of costa and two points towards apex ; postmedial line black, angled outwards at discal fold, excurved between veins 5 and 2, then retracted to below end of cell and again excurved above inner margin ; the terminal area with black bar from apex, crenulate patch from below apex to vein 3 and dentate mark above tornus ; a terminal series of blackish points ; cilia with some fuscous at middle and tornus. Hind wing yellow ; a small black discoidal annulus ; postmedial line black, excurved between veins 5 and 2, then retracted to below the discoidal annulus and oblique to inner margin ; the terminal area with diffused wedge-shaped black patch from apex to vein 3 and oblique bar towards tornus ;

a terminal series of blackish points ; cilia with some fuscous at middle.

*Hab.* RON I. (*Doherty*), 1 ♂ type. *Exp.* 16 mm.

(85 a) *Nacoleia phæopasta*, sp. n.

♀. Head, thorax, and abdomen yellow tinged with rufous and mixed with some brown ; palpi black, white below ; antennæ ringed with black ; pectus and ventral surface of abdomen whitish, the fore tibiæ with black bands. Fore wing yellow irrorated with red-brown : a brown subbasal bar from costa ; antemedial line brown, diffused, curved ; a diffused dark spot in middle of cell and incomplete discoidal annulus ; some blackish points on terminal half of costa ; postmedial line brown, slightly incurved at discal fold, excurved between veins 5 and 2, then retracted to below end of cell and erect to inner margin ; terminal area suffused with brown towards apex and tornus ; a terminal series of slight dark points. Hind wing yellow slightly irrorated with red-brown ; a brown discoidal spot ; postmedial line diffused, brown, excurved between veins 5 and 2, then retracted to the discoidal spot and oblique to inner margin ; the terminal area with brown suffusion from apex to vein 3 and terminal series of points.

*Hab.* SOLOMON Is., Shortland I. (*Ribbe*), 2 ♀ type, Bougainville (*Meek*), 1 ♀. *Exp.* 14 mm.

(94 a) *Nacoleia schistisemalis*, sp. n.

♀. Head and thorax pale grey-brown ; palpi blackish at tips ; frons blackish ; abdomen dorsally fuscous with grey segmental lines ; pectus and ventral surface of abdomen whitish ; legs whitish banded with black. Fore wing greyish suffused with pale red-brown ; a diffused oblique blackish subbasal line ; antemedial line diffused blackish, curved, indistinct, expanding into a black spot on costa ; a slight blackish annulus in middle of cell ; a figure-of-eight-shaped discoidal spot defined by black and with blackish streak above it on costa ; postmedial line minutely dentate, angled outwards below costa and inwards at discal fold, excurved between veins 5 and 2, then incurved and with some dark suffusion on outer side, some dark suffusion beyond it from costa to vein 4 ; a terminal series of small black spots ; cilia grey with series of small blackish spots. Hind wing greyish suffused with fuscous brown rather deeper towards termen ; cilia grey with a dark line through them ; the underside

with dark discoidal spot and indistinct postmedial line, excurved between veins 5 and 2, where it terminates.

*Hab.* PANAMA, La Chorrera (*Dolby-Tyler*), 1 ♀; BAHAMAS, Nassau (*Bonhote*), 1 ♀; PARAGUAY, Sapucay (*Foster*), 1 ♀; ARGENTINA, Florenzia, Gran Chaco (*Wagner*), 1 ♀ type. *Exp.* 22 mm.

[To be continued.]

LXVIII.—*Description of a new Species of Blepharoceridæ from South Africa.* By F. W. EDWARDS, B.A., F.E.S.

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[Plate XX.]

MEMBERS of the peculiar family of gnat-like insects, the Blepharoceridæ, are known from many parts of the world, but up to the present none have been recorded from the Ethiopian Region; and it therefore gives me much pleasure to introduce a species of the family to the African fauna.

On the 4th of December of last year I received from Mr. K. H. Barnard, of the South African Museum, a series of fifteen specimens (13 ♂, 2 ♀), together with larvæ and pupæ, of the insect described below. The adults and pupæ were taken 8. x. 1911, the larvæ 9. ix. 1911, at Platteklip Gorge, Table Mt., Cape Town, at an elevation of 1000 feet.

An examination of these specimens showed them to belong to the genus *Kelloggina*, which so far is only known from a single specimen from Brazil. The generic characters given by Williston all occur in the South African species, with one unimportant exception. Williston states that in *K. rufescens* there is a "strong oblique cross-vein connecting the fourth vein before the anterior cross-vein with the stem of the forked vein behind;" in our species this cross-vein is entirely absent in the majority of specimens, but in two or three it is represented by a stump from the fourth vein, continued, though faint, to just before the bifurcation of the fifth and sixth veins. Hence, as this character is variable, I consider that the present species comes well within the limits of the genus *Kelloggina*, and propose to name it, after its discoverer,

*Kelloggina barnardi*, sp. n.

♂ ♀.—*Head*, including palpi and antennæ, blackish. Antennæ 14-jointed (♀) or 15-jointed (♂), the joints nearly

round and covered with a short dense pubescence, except the last two joints, which are almost bare and in the male slightly larger than the others. Palpi apparently 4-jointed, a little shorter than the proboscis; first, third, and fourth joints about equal in length, second twice as long; a little paler in colour at the base. Proboscis nearly twice as long as the vertical diameter of the head. Front rather broader in female than in male. Three large ocelli present, placed in an equilateral triangle. Pubescence of eyes short, whitish, rather dense. *Thorax*: ground-colour blackish grey; mesonotum with velvety black markings, consisting of a median longitudinal band, bifurcated posteriorly, and two pairs of lateral patches; the posterior pair is sometimes more brownish. *Abdomen* velvet-black, the incisures greyish black. *Wings* clear, the "secondary venation" hardly discernible even with a lens. *Halteres* dark brown, the knob elongate, black. *Legs* dark olive-brown, with a short black pubescence. Claws of female longer and thinner than those of the male; in the male the claws of the fore and mid legs bear several spines on the under side. Length of body 2.5-3.5 mm.; of wing 4.5 mm.

*Larva*.—Much resembles those previously described and figured; there are, however, only two joints in the antennæ. Each segment bears a median ventral sucker and a single latero-ventral prominence on each side hairy at its tip. On the ventral side of the last segment are four nearly spherical anal papillæ; the anal segment is not distinctly separated from the preceding one. Each segment (except the cephalic and the anal) bears a pair of tufts of gill-filaments on the ventral surface near the anterior margin; there are five filaments in each tuft. Length of full-grown larva 6 mm.

The young larvæ do not seem to differ structurally from the full-grown ones.

*Pupa*.—*Ancylus*-shaped. Two pairs of respiratory processes on the dorsal surface of the head-segment. Three pairs of suckers on the lateral edge of the ventral surface, situated close to the anterior margin of the second, third, and fourth abdominal segments. Length 4 mm.; breadth 2.5 mm.; height 1.2 mm.

*Type* in the British Museum.

#### EXPLANATION OF PLATE XX.

*Fig. 1.* Female imago.

*Fig. 2.* Hypopygium of male.

*Fig. 3.* Claws of male: *a*, front, *b*, mid, *c*, hind legs.

*Fig. 4.* Larva, dorsal view. (× 9.)

*Fig. 5.* Pupa, dorsal view (× 9); *5 a*, respiratory processes, side view.



LXIX.—*Descriptions of Two new Mimacræas from Tropical Africa.* By HAMILTON H. DRUCE, F.L.S. &c.Fam. *Lycænidæ*.*Mimacræa eltringhami*, sp. n.

♂. Upperside: fore wing dark brown, with a broad central orange band extending from the costa to the dorsum, angled at vein 4. Hind wing reddish orange, darkest towards the terminal brown border; base brown, a linear mark closing end of cell; a large pure white dorsal patch extending inwards to vein 3. Underside: fore wing as above, but paler and with brown radiating lines at the apex. Hind wing: basal third dark red, dusted with black scales and supporting a number of irregular black spots; beyond this, with its inner edge clearly defined, is a whitish central band, whiter towards the dorsum, covered by radiating brown lines between the veins, and reaching almost to the termen, which is broadly brown. Thorax dark brown; head black, with some white spots; palpi black; antennæ black, with minute white spots; legs black, with white spots. Abdomen brown above, orange below, with black spots.

♀. Upperside dark smoky brown; fore wing with a broad orange band as in ♂; hind wing with a pure white median band reaching from the costa to the dorsum, and with its inner edge more clearly defined than its outer edge; a linear mark closing the cell. Underside as in ♂, but generally greyer, and with the white band of the hind wing more clearly defined.

Expanse, ♂ 56, ♀ 64 mm.

*Hab.* Bugoma Forest, Unyoro, Uganda, B. C. Africa (S. A. Neave, 3. xii. 1911).

*Types:* British Museum.

The female described above is almost exactly like the female *Planema poggii*, Dewitz, in coloration on both surfaces, but the orange and white on the upperside of the hind wing of the male is a type of coloration which I do not find on any of the plates of mimetic associations given by Mr. Eltringham in his interesting 'African Mimetic Butterflies.'

Coloured drawings of both sexes have been prepared by Mr. Horace Knight, and will be published shortly on a plate in the 'Entomologist's Monthly Magazine.'

*Mimacræa costleyi*, sp. n.

♂. Allied to *M. marshalli*, Trimen, from which it differs on the upperside by the fulvous-ochreous areas being brighter and more extensive and by the white apical band being broader, less oblique, more sharply defined, and touching the ochreous area at vein 4. The portion between veins 6 and 7 projecting slightly towards the cell. The black terminal border to the hind wing is considerably narrower than in *M. marshalli*. The veins of both wings are concolorous with the areas which they traverse, excepting the white band of the fore wing, where they are brown. On the underside the fore wing differs from that of *M. marshalli* by the white apical band being as described above and on the hind wing by the ground-colour being yellow, with each vein bordered on both sides with cream, and by a marginal row of black sagittate markings which each black vein centres. Thorax and palpi black; head and legs black, with a few white spots; abdomen yellow, with a few black spots below.

Expanse 60 mm.

*Hab.* Mlanje, Nyasaland, British Central Africa (*E. Costley-White*).

Type: British Museum.

This is a well-marked form, distinguished at once from the insect I have compared it with by the position of the white apical band on the fore wing.

LXX.—*Characters of Six new Pelecypods and Two new Gastropods from the Falkland Islands.* By H. B. PRESTON, F.Z.S.

[Plate XXI.]

*Lævilitorina bennetti*, sp. n. (Fig. 1.)

Shell minute, conically fusiform, with obtuse apex, solid, dark brownish black; whorls  $5\frac{1}{2}$ , regularly increasing, having a somewhat roughened and weathered appearance, the last whorl rather swollen: suture impressed: columella descending in a curve; peristome continuous, slightly dilated below, elsewhere thickened, but not reflexed; aperture roundly ovate; interior of shell livid blackish violet.

Alt. (nearly) 2.25, diam. maj. (nearly) 1.25 mm.

*Hab.* Port Stanley Harbour, Falkland Islands; associated with *Tonicia* (*A. G. Bennett*).

*Lavillitorina lator*, sp. n. (Fig. 2.)

Shell ovately fusiform, rather broad in proportion to its height, semicorneous, dark blackish brown, shading to a yellowish brown behind the labrum, and having a broad basal band of the same colour; whorls 5, the last considerably swollen, having a somewhat weathered appearance under the microscope, and marked only with transverse lines of growth; suture well impressed; columella very obliquely descending above, somewhat sharply curved below; labrum continuous, slightly dilated below, simple on the outer side and callously thickened in the parietal region; aperture broadly ovate; interior of shell shining, brownish purple except towards the base, where it is yellowish brown; operculum thin, horny, polished, shining, with excentric nucleus and having three or four convolutions.

Alt. 4·5, diam. maj. 3·25, diam. min. 2·5 mm.

Aperture: alt. 2·75, diam. 1·75 mm.

*Hab.* Port Stanley Harbour, Falkland Islands (A. G. Bennett).

*Nucula falklandica*, sp. n. (Fig. 3.)

Shell small, obliquely ovate, moderately solid, covered throughout with a cream-coloured periostracum, marked with coarse concentric striæ and broad, rather closely set, radiate costulae, which are more apparent towards the ventral margin; margin of shell finely crenellate by the terminations of the radiate costulae; umbones large, slightly prominent, highly iridescent; dorsal margin rounded anteriorly, rapidly sloping posteriorly; ventral margin rounded; anterior side rounded above, obliquely curved below; posterior side very slightly curved, almost vertically descending, serrated; hinge-teeth coarse and somewhat distant in both valves; interior of shell shining, pearly, bluish white.

Long. 3, lat. 2·5 mm.

*Hab.* Port Stanley, Falkland Islands; taken from the stomach of a fish (A. G. Bennett).

*Cyamium bennetti*, sp. n. (Fig. 4.)

Shell thin, obtusely cuneiform, white, iridescent, covered with a thin cream-coloured periostracum, sculptured with fine concentric growth-lines; both valves radiately angled posteriorly; umbones moderately large and prominent; dorsal margin anteriorly concavely sharply sloping, posteriorly concavely gently sloping; ventral margin very gently

rounded; anterior side obtusely rounded; posterior side sloping above, rounded below, subtruncate; right valve bearing two teeth, of which the anterior is very broad and squarish and the posterior broad at the base somewhat narrowing but obtuse at the apex; left valve bearing a coarse, rounded, nodulous, anterior tooth and a narrow, slightly curved, posterior tooth; hinge-plates moderately short and narrow; interior of shell white.

Long. 3.5, lat. 5.75 mm.

*Hab.* Port Stanley, Falkland Islands; from the stomachs of fish (*A. G. Bennett*).

*Cyamium exasperatum*, sp. n. (Fig. 5.)

Shell small, ovate, white, somewhat iridescent, sculptured, especially towards the ventral margin, with concentric growth-ridges; umbones moderately large, not prominent; dorsal margin rather convexly sloping posteriorly, slightly concavely sloping anteriorly; ventral margin very slightly curved; anterior side rounded; posterior side somewhat truncate; anterior cardinal in right valve broad, oblique, posterior cardinal small, very oblique; anterior cardinal in left valve small, very oblique, somewhat curved above, posterior cardinal short, broad; hinge-plates considerably projecting, especially in left valve; interior of shell white.

Long. 3.25, lat. 4.5 mm.

*Hab.* Port Stanley, Falkland Islands; taken from the stomachs of fish (*A. G. Bennett*).

*Cyamium piscium*, sp. n. (Fig. 6.)

Shell subrectangular, rather thin, white, iridescent, showing traces of having been covered with a thin, pale yellowish-brown periostracum, sculptured with fine concentric striae, especially towards the ventral margin; umbones large, somewhat prominent; dorsal margin anteriorly sloping, angularly excavated, posteriorly gently sloping; ventral margin slightly contracted in the median region; anterior side rounded; posterior side obtusely rounded, slightly produced; right valve bearing a large, nodulous, anterior cardinal and a small, oblique, posterior cardinal tooth; left valve bearing a rather fine, oblique, anterior cardinal and a stronger and less oblique posterior cardinal tooth; hinge-plate moderately projecting except in the right valve in front of the



anterior cardinal tooth, where it considerably overhangs the interior of the shell; interior of shell white.

Long. 2.5, lat. 4.25 mm.

*Hab.* Port Stanley, Falkland Islands; taken from the stomachs of fish (*A. G. Bennett*).

A great many specimens of the above three species have been opened, and in nearly every case they have been found to bear a more or less number of pearly blisters; sometimes these occur not only on the inner surface of the valves, but also on the hinge-plate, giving at first sight the idea that a complicated system of teeth is exposed to view.

*Davisia* \* *bennetti*, sp. n. (Fig. 7.)

Shell suborbicular, almost equilateral, rather solid, cream-coloured, slightly iridescent, concentrically striate; umbones not very large, prominent; dorsal margin anteriorly arched, posteriorly sloping; ventral margin and anterior and posterior sides rounded; right valve bearing an obsolete cardinal tooth, a narrow, erect, anterior and a broader and curved posterior lateral; left valve bearing a small, slightly oblique, pointed cardinal tooth, a weak anterior and a broader, much stronger and curved posterior lateral; interior of shell white.

Long. 3.5 (about), lat. 3.75 mm.

*Hab.* Port Stanley, Falkland Islands; taken from the stomachs of fish (*A. G. Bennett*).

*Davisia concentrica*, sp. n. (Fig. 8.)

Shell small, subovate, moderately solid, white, coarsely concentrically striate throughout; umbones large and somewhat prominent; dorsal margin anteriorly sloping, posteriorly more gradually so; ventral margin gently rounded, as are also the anterior and posterior sides; right valve bearing a short, straight, rather weak cardinal tooth, an angular anterior lateral and an elongate posterior lateral tooth, biangulate in the median part; left valve bearing a badly defined oblique cardinal and somewhat elongate weak laterals on either side; hinge-plates projecting more in the right than in the left valve; interior of shell white.

Long. 2.25, lat. (nearly) 2.75 mm.

*Hab.* Port Stanley, Falkland Islands; taken from the stomachs of fish (*A. G. Bennett*).

\* Ann. & Mag. Nat. Hist. 1910, vol. v. p. 113.

## EXPLANATION OF PLATE XXI.

- Fig. 1. *Lævitorina bennetti*, sp. n.,  $\times 8$ .  
 Fig. 2. — *latior*, sp. n.,  $\times 8$ .  
 Fig. 3. *Nucula falklandica*, sp. n.,  $\times 8$ .  
 Fig. 4. *Cyamium bennetti*, sp. n.,  $\times 8$ .  
 Fig. 5. — *exasperatum*, sp. n.,  $\times 8$ .  
 Fig. 6. — *piscium*, sp. n.,  $\times 8$ .  
 Fig. 7. *Davisia bennetti*, sp. n.,  $\times 8$ .  
 Fig. 8. — *concentrica*, sp. n.,  $\times 8$ .

LXXI.—*New Genera and Species of Rhynchota*  
 (Homoptera). By W. L. DISTANT.

Fam. Cicadidæ.

*Pycna neavei*, sp. n.

Head and pronotum ochraceous; head with a transverse fascia near base of front, continued across anterior angles of vertex, a transverse fascia to vertex enclosing the ocelli and two rounded spots on each side before eyes, black; pronotum with a transverse fascia near anterior margin, a central longitudinal fascia widened posteriorly, the fissures, lateral and posterior margins (the last very narrowly), and an oblique fascia on lateral membrane near posterior angles, black; mesonotum and abdomen above castaneous; pronotum with three elongate black spots and a rounded spot before each anterior angle of the cruciform elevation, black; mesonotal margins and the tympanal coverings ochraceous; the last two abdominal segments cretaceously tomentose; body beneath and legs ochraceous, the opercula paler in line, space between face and eyes with transverse black streaks, longitudinal sulcation to face black; femora more or less annulated and marked with black, tibiæ castaneous, tarsi piceous; apex of rostrum black; tegmina hyaline, about basal half opaque, fuscous, with piceous spots and a hyaline spot beyond middle of radial area, costal membrane ochraceous with a black spot at a short distance from base, beyond the basal opaque area the transverse veins at the bases of apical areas are broadly piceous on each side, the longitudinal veins to apical areas with a piceous spot before and a smaller spot at their apices; wings hyaline, with the basal two-thirds brownish ochraceous, opaque, the veins of the same colour;

head (including eyes) only about or little more than two-thirds the width of base of mesonotum; pronotal lateral margins ampliate, the angular apices reaching base of basal cell of tegmina, these margins are rounded anteriorly, truncate at middle, thence oblique to basal margin, basal marginal area transversely wrinkled; abdomen in male as long as pronotum and mesonotum together, including the basal cruciform elevation; rostrum reaching the basal segment of abdomen; opercula in male short, transverse, not passing the basal abdominal segment, slightly rounded laterally and posteriorly, not meeting internally; anterior femora with two strong spines near apices, posterior tibiae with some long spines on each side beyond middle.

Long., excl. tegm., ♂ 26, ♀ 27 mm.; exp. tegm., ♂ 81, ♀ 87 mm.

*Hab.* Nyasaland; between Ft. Mangoche and Chikala Boma, about 4000 ft. (*S. A. Neave*, Brit. Mus.).

A species allied to *P. hecuba*, Dist.

*Dundubia helena*, sp. n.

Body and legs brownish ochraceous; apical spot to front of head, lateral and posterior margins of pronotum, posterior margin of metanotum, tympanal coverings, narrow posterior segmental margins to abdomen above, opercula, and abdomen beneath, pale ochraceous; tegmina and wings hyaline, the venation brownish or pale ochraceous; head about as long as pronotum, the front large and convex, about twice as broad at its base as the length of the anterior margins of the lobes of vertex; lateral margins of the pronotum distinctly toothed; abdomen very little longer than space between apex of head and base of cruciform elevation; opercula in male long, extending to base of sixth abdominal segment, strongly concavely narrowed on each side near base and thence convexly amplified; rostrum scarcely reaching the posterior coxæ; second apical area of the tegmina little more than half the length of the first.

Long., excl. tegm., ♂ 35 mm.; exp. tegm. 88 mm.

*Hab.* N. India; Dehra Dun (Brit. Mus.).

Allied to *D. mannifera*, Linn., but differing in the shape of the opercula, which are strongly concavely narrowed on each side near base; the second apical area to the tegmina is very short, distinctly shorter than the corresponding area in *D. mannifera*.

*Meimuna cassandra*, sp. n.

Head black, with the following ochraceous markings—a spot at apex of front and lateral striations to same, lateral margins of vertex, inner margins to eyes, and suffusions at area of ocelli; pronotum ochraceous, two central fasciæ, an elongate spot on each side of disk, the fissures, and lateral posterior margins, black; mesonotum ochraceous, with five longitudinal black fasciæ, the three central shortest and connected posteriorly, the lateral fasciæ longest and broadest and containing a basal ochraceous spot, a large transverse black spot in front of the cruciform elevation; abdomen above black, the posterior segmental margins pale ochraceous, two lateral brownish spots before middle; tympanal coverings very pale ochraceous; body beneath and legs ochraceous; transverse striations and central sulcation (excluding base) to face, a transverse spot between face and eyes, posterior areas of cheeks, lateral areas of clypeus, and central spots to the last two abdominal segments, black; tegmina and wings hyaline, the venation fuscous, tegmina with the basal veins to the second and third apical areas lightly infuscate; head (including eyes) about as broad as base of mesonotum, area of the ocelli distinctly centrally sulcate; lateral margins of the pronotum distinctly, acutely toothed before middle; rostrum reaching the posterior coxæ; opercula reaching the third abdominal segment, their outer margins subparallel, inwardly widest but not meeting near posterior coxæ, inner margins oblique, apices narrowly rounded.

Long., excl. tegm., ♂ 28 mm.; exp. tegm. 72 mm.

*Hab.* N. India; near Dehra Dun (Brit. Mus.).

In superficial appearance strongly resembling *M. opalifera*, Walk., from Corea and Japan, but differing very much in the shape of the opercula in the male, in Walker's species these being narrowed and angulated at apices.

*Khimbya immsi*, sp. n.

Body and legs ochraceous; two transverse black lines (not meeting medially) on anterior margin of front, two linear black transverse spots (sometimes indistinct) on each marginal area of vertex before eyes, the interior margins of which are also black; mesonotum with four ill-defined obconical spots and four minute black spots on its anterior margin; abdominal segments above with transverse darker suffusions; bases of metasternum and first abdominal segment beneath black; tegmina and wings hyaline, the venation, costal



membrane and extreme base of tegmina, and upper inner margin of abdominal area to wings, ochraceous; head considerably shorter than space between eyes; pronotum with the lateral margins sinuate, obtusely and subangularly prominent before middle; tympana imperfectly covered, the flaps shorter and narrower than tympanal cavities; rostrum almost reaching the posterior coxæ; opercula in male inwardly obliquely divergent, extending to about the apex of third abdominal segment, their apices somewhat broadly rounded.

Long., excl. tegm., ♂ 23–27 mm.; exp. tegm. 67–74 mm.

Hab. Assam; Goalpara (Brit. Mus.).

This species, which was sent me by Dr. A. D. Imms, Forest Zoologist to the Government of India, can be separated from the other Indian species of the genus as yet described by the broader apices of the opercula and the non-infusate transverse veins to tegmina.

*Fidicina sawyeri*, sp. n.

♀. Head, pronotum, and mesonotum more or less olivaceous; head with a transverse black fascia in front of and enclosing the ocelli; mesonotum with two short, anterior, obscure spots only denoted outwardly by their black margins, a spot at each anterior angle and a transverse central spot at anterior margin of the cruciform elevation black; abdomen above black, palely pilose, the middle of the three basal segments olivaceous; body beneath and legs ochraceous, central sulcation to face, apex of rostrum, and spines to anterior femora, black; tegmina and wings hyaline, the venation olivaceous or picuous, both yellowish green on basal area (including basal cell of tegmen) and bright sanguineous at posterior base of tegmen and occupying upper two-thirds of abdominal area to wings; metasternum transversely elevated and anteriorly produced to about the intermediate coxæ; head (including eyes) about as wide as base of mesonotum; eyes not porrect; head centrally, longitudinally compressed, and also longitudinally impressed before eyes; lateral margins of the pronotum a little sinuate near base, obliquely recurved at the basal lateral angles.

Long., excl. tegm., ♀ 33 mm.; exp. tegm. 108 mm.

Hab. Brazil; near Rio de Janeiro (*E. E. Sawyer*, Brit. Mus.).

This species is intermediate between *F. sericans*, Stål, and *F. rosa-cordis*, Walk.; the tegmina are unspotted as in *sericans*, and the basal area of the wings has the beautiful markings of Walker's species. A female specimen only being available, it is impossible to give the differential characters of the opercula.

*Odopœa degiacomii*, sp. n.

Head, pronotum, and mesonotum black; a spot at apex of front, a spot on each lateral margin, and a broken irregular basal fascia to vertex testaceous, the latter containing a small black spot on each side; pronotum with the lateral and basal margins, posterior lateral margins of mesonotum, the cruciform elevation, and abdomen above and beneath, testaceous; head beneath, sternum, legs, tympanal coverings, and opercula black; anterior central spot to face, a marginal spot between face and eyes, anterior margins of cheeks, rostrum, coxæ, a subapical annulation to anterior femora, apices of all the femora, a subbasal annulation to the intermediate tibiæ, the whole of the posterior tibiæ (excluding base), and the posterior tarsi, testaceous; tegmina and wings creamy hyaline, the venation black or fuscous; tegmina with the costal membrane and costal area, basal cell, the oblique vein at apex of radial area, and the transverse veins at bases of apical areas distinctly black; wings with the inner and outer margins of abdominal area, and a narrow posterior margin, distinctly black; tympanal coverings outwardly complete, the orifices only exposed inwardly; opercula in male short, transverse, not extending beyond base of abdomen, and almost meeting inwardly; rostrum reaching the posterior coxæ; head (including eyes) about equal in width to base of mesonotum; pronotum with the lateral areas broadly, subangulately produced.

Long., excl. tegm., ♂ 37 mm.; exp. tegm. 101 mm.

*Hab.* Brazil; Santos (coll. Dr. de Giacomi).

The nearest ally of this distinct species is *O. strigipennis* Walk., from Haiti.

## UHLEROIDES, gen. nov.

♂. Head slightly shorter than pronotum, front considerably shorter than vertex, lateral margins of both nearly continuous and both centrally, longitudinally finely sulcate; ocelli a little farther apart from eyes than from each other, vertex impressed between ocelli and eyes, the latter scarcely projecting beyond the anterior pronotal angles; pronotum shorter than mesonotum, the lateral margins moderately ampliate but not angulate; mesonotum shorter than head and pronotum together; abdomen about as long as space between apex of head and base of cruciform elevation; tympanal coverings globose and projecting beyond the lateral margins of the abdomen, outwardly complete, the orifices

only exposed inwardly ; opercula not extending beyond base of abdomen, laterally and apically rounded, not meeting internally ; rostrum reaching the posterior coxæ ; face longer than broad, lateral margins a little sinuate near base, finely centrally sulcate on posterior half, strongly transversely striate, the lateral margins a little broadly reflexed ; tegmina three times as long as broad, hyaline, eight apical areas, basal cell longer than broad ; wings about half as long as tegmina, six apical areas ; anterior femora armed with two spines beneath.

I name this genus after my friend Dr. P. R. Uhler, who sent me the species on which it is founded. It is placed in my division *Zammararia* and differs from all other genera of that group by the greatly produced tympanal coverings.

*Uhleroides cubensis*, sp. n.

♂. Body more or less pale brownish ochraceous ; head with central margin and longitudinal line to front, area of ocelli, and two obliquely transverse lines between ocelli and eyes, black ; pronotum with a central fascia broadened anteriorly, the fissures, inner lateral margins, two discal longitudinal spots and a spot at centre of inner basal margin, black ; mesonotum with the margins of two central obconical spots, a more broken sublateral fascia on each side, a central fascia before the cruciform elevation and a spot before each anterior angle of same, black ; tympana pale ochraceous, their apical angles margined with fuscous ; head beneath, sternum, legs, and rostrum pale ochraceous ; anterior margins between face and eyes, anterior striations to face and apex of rostrum, black ; abdomen beneath piceous, the lateral margins broadly ochraceous ; tegmina and wings hyaline, venation ochraceous or piceous ; tegmina with the costal membrane and postcostal area ochraceous, the transverse veins at the apices of the three upper ulnar areas and the apices of the longitudinal veins to apical areas infuscate ; structural characters as in generic diagnosis.

Long., excl. tegm., 20 mm. ; exp. tegm. 64 mm.

*Hab.* Cuba (Brit. Mus.).

*TUGELANA*, gen. nov.

Head short and broad, including eyes about as broad as base of mesonotum, vertex more than twice as broad as long, ocelli farther apart from eyes than from each other, eyes obliquely directed backward ; face a little longer than broad,

very broadly longitudinally sulcate, lateral areas transversely striate; pronotum almost as long as mesonotum, the lateral margins roundly ampliate, twice as broad at base as long, the fissures profound, anterior margin truncate, posterior margin very slightly sinuate at middle; abdomen in male about as long as space between the apex of head and base of cruciform elevation; tympana partly exposed, the coverings being a little shorter and considerably narrower inwardly; rostrum reaching the posterior coxæ; opercula in male scarcely extending beyond base of abdomen, not meeting inwardly, obliquely transverse, laterally and apically rounded; anterior femora incrassated, with two short but broad teeth at apex; tegmina more than twice as long as broad, opaque, basal cell slightly longer than broad, ulnar areas moderately elongate, apical areas eight, the uppermost long and narrow; wings a little more than half the length of tegmina, apical areas six.

This is one of the few Ethiopian genera belonging to the subfamily Gæaninæ, and may be placed near the genus *Hanza*; like that genus, apart from the tympanal structural characters, it has a superficial resemblance to the genus *Platypleura*.

*Tugelana butleri*, sp. n.

♂. Body and legs ochraceous; lateral areas of the abdomen above very broadly fuscous; two black punctures on each side of ocelli; mesonotum with indications of four darker obconical spots; tegmina pale brownish ochraceous, opaque, the venation and costal membrane paler ochraceous, a prominent dull milky white spot crossing the two upper ulnar areas, and some more obscure pale suffusions on the apical areas; wings bright ochraceous, the apical areas more or less apically infuscate, the membrane creamy white; vertex incised between the ocelli; legs longly pilose; posterior tibiæ spined on each side beyond middle, other structural characters as in generic diagnosis.

Long., excl. tegm., ♂ 15 mm.; exp. tegm. 48 mm.

*Hab.* Zululand; Maputa.

Dr. E. A. Butler received this species from one of his correspondents and kindly placed the same in the National Collection; the species bears his name.

*Quintilia pomponia*, sp. n.

♀. Head black, anterior margin of front with some obscure yellow spots, ocelli testaceous; pronotum brownish



ochraceous, somewhat thickly pilose, with a broad central black fascia widened anteriorly and posteriorly and enclosing a central longitudinal ochraceous line, obscure black oblique fasciae on each lateral area, and the posterior margin also more or less suffused with black; mesonotum black, with two obconical spots margined with ochraceous and with more or less well-defined ochraceous suffusions; abdomen above black, pilose, the posterior margins of the segments faintly narrowly paler; body beneath black, strongly palely pilose, disk of abdomen ochraceous, with central black spots; legs black or piceous; coxæ, trochanters, bases of femora and basal annulations to intermediate and posterior tibiæ, ochraceous; face and rostrum black, the lateral areas of the first strongly palely pilose, basal annulation to the latter ochraceous; tegmina and wings hyaline, narrowly ochraceous at base; tegmina with the costal membrane and basal cell ochraceous, apical vein to radial area, apical vein to lower ulnar area, basal vein to second apical area, and a spot near middle of lower vein to third ulnar area infuscate; wings with the bases of the apical areas (excluding sixth), a large spot near inner apex of abdominal area, and two more obscure basal spots, black or fuscous; head (including eyes) narrower than base of mesonotum; posterior angles of pronotum broadly ampliate; mesonotum (including cruciform elevation) about as long as head and pronotum together; abdomen robust, longer than space between apex of head and base of cruciform elevation; tegmina about three times as long as broad.

Long., excl. tegm., ♀ 19 mm.; exp. tegm. 49 mm.

*Hab.* North India; near Dehra Dun (Brit. Mus.).

Allied to *Q. subvitta*, Walk., but a larger species; tegmina and wings with considerably less fuscous markings, the two upper ulnar tegminal areas longer, the second not only longer but much more attenuated anteriorly, basal cell distinctly broader, lateral margins of pronotum more angulate anteriorly; abdomen longer than in corresponding sex of *Q. subvitta*.

#### JAFUNA, gen. nov.

Head long, porrect, about as long as the pronotum, front porrectly produced, triangular, the apex subacute, longitudinally sulcate, vertex prominent at its anterior lateral angles, centrally longitudinally incised, the ocelli nearer to each other than to eyes; eyes longer than broad; pronotum shorter than mesonotum, more or less centrally longitudinally incised, the posterior lateral angles moderately backwardly

produced; abdomen in male long, somewhat globular, apically attenuated, much longer than space between apex of head and base of cruciform elevation; tympana entirely exposed; rostrum scarcely reaching the intermediate coxæ; face compressed, centrally flattened, the sides transversely striate; antennæ robust and prominent; opercula in male scarcely extending beyond base of abdomen, outwardly oblique, apically roundly truncate, not meeting internally; tegmina and wings hyaline; tegmina three times as long as broad, basal cell much longer than broad, second ulnar area subquadrate, apical areas eight; wings with five apical areas.

Allied to *Rhinopsalta*, Melich., but differing by the tegmina possessing eight apical areas, not seven as in Melichar's genus; head with the front not acutely produced.

*Jafuna melichari*, sp. n.

Body and legs greenish ochraceous; head with the margins of front, the antennæ, lateral margins of pronotum, and posterior segmental margins to abdomen, black; apices of tibiæ and the tarsi carmine-red, the latter apically black; opercula pale green, with their margins again distinctly paler; tegmina and wings hyaline, the veins greenish on basal, piceous on apical areas; a distinct black foveate spot near each anterior angle of the basal cruciform elevation, these anterior angles being also black; other structural characters as in generic diagnosis.

Long., excl. tegm., 16 mm.; exp. tegm. 42 mm.

*Hab.* Madagascar; Tamatave (Brit. Mus.).

*BIJAURANA*, gen. nov.

Allied to *Taipinga*, Dist. (Ann. & Mag. Nat. Hist. (7) xvi. p. 210 (1905)), but the tegmina with only seven apical areas, the first and seventh areas about equal in length; front very much shorter than vertex, which is distinctly longitudinally sulcate at base; pronotum a little longer than head, the lateral margins oblique, slightly sinuate, the posterior angles moderately, subangularly ampliate; abdomen longer than space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula in male about reaching base of abdomen, not meeting internally, apical margins obliquely rounded; rostrum reaching the intermediate coxæ.

*Bijaurana typica*, sp. n.

Body and legs dull ochraceous; ocelli red; eyes piceous;

mesonotum with more or less distinct indications of four obconical darker spots; tegmina and wings hyaline, the former with the venation ochraceous, the costal margin narrowly black, the latter with the veins ochraceous, the upper half of the abdominal area and the outer margin of same palely infusate, opaque; head (including eyes) a little narrower than base of mesonotum; rostrum piceous, reaching the intermediate coxæ; face somewhat compressed, longer than broad, distinctly, finely, centrally sulcate, the transverse striations somewhat obscure.

Long., excl. tegm.,  $12\frac{1}{2}$  mm.; exp. tegm. 29 mm.

*Hab.* Nepal; Bijaura (Ind. & Brit. Mus.).

*Bijaurana sita*, sp. n.

♂. Head almost totally black, ocelli red; pronotum dull ochraceous with some piceous suffusions; mesonotum ochraceous, with four large black obconical spots, the two central spots shortest; abdomen above ochraceous, a central fascia and marginal segmental spots pitchy brown; body beneath and legs ochraceous, space between face and eyes, rostrum, and a central basal spot to abdomen piceous; tegmina and wings hyaline, both marked as in the preceding species (*B. typica*); pronotum centrally distinctly and somewhat broadly longitudinally sulcate, by which character—apart from coloration—it principally differs from *B. typica*.

Long., excl. tegm., ♂ 12 mm.; exp. tegm. 29 mm.

*Hab.* India; United Provinces (Brit. Mus.).

A female specimen from Nepal, belonging to the Indian Museum, may prove to be the other sex of this species.

*Melampsalta zenobia*, sp. n.

Body above black, shortly greyishly pilose; lateral margins of vertex, margins and a central fascia to pronotum, margins and a large discal anteriorly triangulated spot to mesonotum, cruciform elevation, tympana, and posterior segmental margins, testaceous red; body beneath and legs reddish testaceous; face (excluding margins), cheeks, bases of tibiæ, tarsi (more or less), and a central spot at base of abdomen, black; opercula ochraceous, greyishly pilose; rostrum not extending beyond the intermediate coxæ; tegmina and wings hyaline, the venation reddish or fuscous; wings with the margins of the abdominal area more or less fuscous.

Long., excl. tegm.,  $15-15\frac{1}{2}$  mm.; exp. tegm. 36 mm.

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*Hab.* Nepal ; Gowchar, Thankote, Nagorkote (Ind. & Brit. Mus.).

Allied to *M. literata*, Dist., but differing in the narrower and more elongate face, different coloration and markings, &c.

Fam. Fulgoridæ.

Subfam. *ISSINÆ*.

DELHINA, gen. nov.

Head (including eyes) very slightly narrower than anterior margin of pronotum, vertex concave, transverse, broader than long, lateral margins strongly amplately ridged, anterior margin a little sinuate; face with the greatest breadth about equal to greatest length, the anterior margin strongly concave, the disk moderately convex and tricarinate, the lateral margins amplately ridged and narrowing towards clypeus; clypeus about as long as the lateral margins of face, tumid and very distinctly centrally carinate; pronotum a little shorter than vertex of head, the base truncate, the anterior margin convexly rounded between the eyes; mesonotum subtriangular, somewhat faintly tricarinate and with a short carination near each anterior angle; abdomen broad, slightly tumid above, flattened beneath; posterior tibiae with two strong spines, posterior tarsi with the basal joint longest; tegmina as long as greatest length of body, considerably narrowed towards apex, costal margin arched and convex at basal area, costal membrane broad, transversely, obliquely, somewhat reticulately veined, longitudinal veins more or less reticulately connected towards apical area, claval veins more or less transversely connected; wings much broader than tegmina, the margins convex, a moderately deep fissure on apical margin near apex, reticulately veined.

Allied to *Gelastyra*, Kirk. (*Oibyra*, Stål).

*Delhina eurybrachydoides*, sp. n.

Head and pronotum pale fuscous brown; pronotum with distinct darker longitudinal fasciæ, about five in number; abdomen above testaceous red; body beneath and legs brownish ochraceous; femora more or less annulated with piceous; abdomen beneath with segmental transverse black fasciæ; tegmina dull ochraceous, much mottled with piceous, these suffusions appearing as a short, broad, oblique fascia near base, extending from costa to about middle of tegmen; wings golden yellow, apical margin on each side of fissure



broadly piceous; face moderately piceous, more ochraceous towards the clypeus, and there with a small piceous spot on each side; structural characters as in generic diagnosis.

Long., excl. tegm.,  $9\frac{1}{2}$  mm.; exp. tegm. 25 mm.

*Hab.* Eastern Himalayas (Brit. Mus.).

Subfam. *RICANIINÆ*.

*Ricanoptera variegata*, sp. n.

Vertex of head, pronotum, and mesonotum blackish, more or less thickly covered with greenish or greenish-ochraceous pubescence; abdomen above, body beneath, and legs ochraceous; tegmina with about the basal fourth greenish pubescent, central area greyish suffused with blackish and containing a prominent central black spot, apical area more distinctly piceous, costal margin ochraceous spotted with black; wings very pale fuliginous, the veins a little darker; posterior tibiæ with two spines; vertex of head narrow, transverse, its anterior angles shortly spinous before eyes; pronotum centrally carinate; mesonotum tricarinate, the outer carinations bifurcate anteriorly.

Long., excl. tegm.,  $5\frac{1}{2}$  mm.; exp. tegm. 17 mm.

*Hab.* Ceylon; Puttalam (*Green*, Brit. Mus.).

Allied to *R. opaca*, Dist.

*Gætulia montana*, sp. n.

Body and legs dull virescent or greenish ochraceous; anterior margin of vertex narrowly piceous; abdomen above with a transverse fascia before middle, followed by a broken longitudinal fascia, piceous; legs and rostrum more ochraceous than virescent; tegmina and wings hyaline, the venation fuscous, the tegmina with a somewhat large and distinct fuscous marginal spot at end of costal membrane, the wings with a distinct fuscous spot at apex of abdominal area; anterior margin of vertex angulate, the apices of its lateral margins angularly prominent; mesonotum distinctly longitudinally tricarinate; face much longer than broad, the lateral margins nearly subparallel; tegmina with the costal membrane distinctly arched and broad, narrowed at base and apex.

Long., excl. tegm., 5 mm.; exp. tegm. 17 mm.

*Hab.* E. Himalayas; Kurseong, 5000 ft.; Darjiling, 6000 ft. (Brit. & Ind. Mus.).

Allied to *G. nigrovenosa*, Melich., but the face longer

and its lateral margins nearly straight, not widened towards clypeus; the fuscous spot to wings sometimes absent.

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*Synonymical Note.*

Genus *TAMBUSANA*.

*Tambusa*, Dist. Insect. Transvaal. p. 216 (1908), nom. præocc.  
*Tambusana*, n. nom.

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LXXII.—*Two new Species of Palarus from S. Africa.*

By Dr. H. BRAUNS.

THE following two *Palarus* species form amongst the known South-African species, and together with *P. comberi*, Turner, a distinct group.

Mr. Turner, in "Notes on Fossorial Hymenoptera.—IV.," Ann. & Mag. Nat. Hist. ser. 8, vol. vii., May 1911, divides the species of *Palarus* known to him with certainty into five groups, according to the apical abdominal segment of the males. *P. pentheri* he assumes to form a sixth group.

With the better knowledge of the females I think it will be possible to form more natural groups than such preliminarily based on males only.

The affinities of the South-African species are, taking both sexes into consideration:—

1. *Palarus o'neili*, Br., and *Palarus pentheri*, Br.
2. *Palarus latifrons*, Kohl.
3. *Palarus handlirschi*, Br., and *Palarus turneri*, Br.

Group 3 is nearest related to *P. latifrons*, Kohl. The main characters of this group are:—

♂.—Seventh tergite broadly subtruncate or rounded at apex and without spines.

♀ ♂.—First tergite *not* sharply edged on the sides, without sharp dentiform tubercle. Eyes on the vertex very narrowly separated in both sexes. Abdomen hardly constricted, not at all in the females. Cellula radialis of the fore wings without appendix, the apex triangularly pointed or subtruncate. Habitus, especially the female, of *Tachytes*.

♀ *P. handlirschi*, m.—Pygidium very sharply pointed; surface of the pygidial area finely and nearly regularly

carinated. Distance of the eyes on vertex about the length of the pedicellus of the antennæ.

♀ *P. turneri*, n.—Pygidium less sharply pointed; surface of the pygidial area irregularly rugose-carinated. Distance of eyes on vertex at least double the length of the pedicellus of the antennæ.

*Palarus handlirschi*, ♀ ♂, sp. n.

*Type*: ♂. Niger, clypeo, macula mandibularum, macula faciei inferioris, maculis duabus punctiformibus supra antennis, tegulis, fasciisque tergitorum 1-5 oburneis; pedibus flavido-variegatis, alis hyalinis. Pygidium inerme. Tergita vix constricta. Lateralia pygidii ad basin rotundato-lobata, postea ad apicem gradatim coarctata, apice rotundato. Lateralia tergiti sexti longitudinaliter breviter et subtiliter carinata. Sternum secundum toro magno transverso ornatum. Oculi in vertice longitudine pedicelli antennarum separati.

Long. 8-12 mm.

♂.—Clypeus smooth, shining, rounded at apex. Inter-antennal space not carinated; front with a thin smooth line, not quite reaching the anterior ocellus. Mandibles acuminate, simple. Antennæ thickened towards apex, the second joint of flagellum about a third longer than the following. Anterior ocellus large, round, the posterior smaller, oval, touching the eyes. Eyes separated on the vertex by a distance about equal to the length of the pedicellus of the antennæ. Face covered by a whitish pile, dull, not shining, minutely but densely punctured. Thorax, scutellum, and metanotum above minutely but less densely punctured, shining, sparsely covered by a whitish pubescence. Area cordata deepened, nearly semicircular, finely shagreened. First tergite concave in the middle, the edges of the concavity not sharp nor carinated. Sixth tergite with a very small longitudinal carina on the sides. Pygidial segment roundly dilated-lobate at the sides towards the base, then gradually constricted towards the apex, the latter rounded. Pygidial area indistinctly defined, rugulose. The sides and apex of the pygidial segment smooth and shining. The tergites are not constricted on the sides, very little above, shining, very finely punctured, gradually narrowed towards the apex. The second sternite is smooth and very shining, the apical half transformed into a broad transverse elevation, the basal upper edge of which is rounded, the apical semi-abrupt, but not sharply edged. The following segments are flat, punctured, the middle depressed, the seventh conical, rounded at the apex. Radial

cell triangular at apex, with hardly any trace of an appendix. Second cubital cell sessile, triangular. Recurrent nervures interstitial. Third cubital cell nearly rectangular.

Black; yellow are the clypeus, a spot on the upper side of the mandibles near the base, the margin of the face adjoining the clypeus, broadly between eyes and clypeus, two small spots above the antennæ, the tegulæ and the transverse bands of the tergites 1-5, of which the first and last two or three are more or less broadly interrupted, the fifth sometimes largely reduced in size. The extension of the bands varies probably within certain limits. The colour of the bands is paler than clypeus &c. The greater part of the mandibles, scapulæ, pygidial segment, and the ventral surface are ferruginous, the tergites except the bands darkish brown, the base more blackish. Legs light brown. Tibiæ ii. and femora i. and ii. yellow underneath. Median segment and abdominal base thickly clothed with long white pubescence. Wings hyaline, with nervures testaceous. Flagellum of the antennæ brown.

♀.—As in the male, but mostly without the yellow spots above the antennæ. Abdominal segments not constricted on the sides and above, less narrowed towards the apex. The yellow fasciæ are broader and more complete. Legs all ferruginous, the femora 1 and 2 yellow beneath.

Sternites without tubercles, the second sparsely punctured. Pygidial segment long, pointed at the apex, the sides raised and carinate. Pygidial area sharply defined, raised, finely and regularly carinate on the surface (about 8-10 longitudinal carinulæ). The space between area and edges of the segment smooth and shining. The sixth sternite long, pointed at apex, compressed in the middle.

The distance of the eyes on the vertex is in both sexes very nearly the same. The female seems to be somewhat smaller than the male.

*Hab.* Willowmore, Cape Colony; nesting in the sand of dry river-beds, November-January.

The prey of this species comprised *Nomia*, *Halictus*, *Elis*, &c., in one case a Dipteron; the latter probably a mistake!

Mr. Turner, to whom I sent the species, informs me that the British Museum has a pair of this species from the Zambesi and S. Nyasaland, in which all ferruginous colour is replaced by black; but otherwise they agree perfectly with the southern specimens. He further points out a close relationship with the Indian *Palarus comberi*, Turner.



*Palarus turneri*, ♀, m., sp. n.

*Type*: ♀. Niger, clypeo, macula mandibularum, macula faciei inferioris, maculis duabus obliquis supra antennis, tegulis, margine pronoti superiore, macula magna mesopleurarum, scutelli parte posteriore, metanoto toto, fasciis latis tergitorum 1-3, tergitis 4-6 totis eburneis. Pedes, coxis et trochanteribus inclusis, ferruginei, subtus albicantes. Tergita nec constricta. Oculi in vertice duplo longitudine pedicelli antennarum distantes. Pygidium acutum, area pygidialis irregulariter longitudinaliter rugosa. Metanoti medium leniter incisum.

Long. 10 mm.

♀.—Clypeus smooth, shining, broadly rounded at apex. Interantennal space not carinate, front with a fine smooth line not quite reaching the anterior ocellus. Vertex between the eyes finely longitudinally raised. Mandibles acuminate, simple. Antennae thickened towards the apex. Eyes separated at the vertex by a distance about equal to double the length of the pedicellus of the antennae. Face dull, not shining, minutely punctured. Mesonotum shining, disc sparsely, margins densely and finely punctured; scutellum shining, with scattered punctures. Metanotum smooth, in the middle distinctly incised. Area cordata deepened, in the middle finely shagreened, dull. First tergite concave in the middle, edges of the concavity rounded, smooth. Tergites minutely and densely punctured. Pygidial segment long, pointed, the sides carinate, the pygidial area longitudinally rugulose, dull. Space between the area and the sides of the segment smooth above, diagonally rugose towards the apex. Pubescence much sparser than in *P. handlirschi*.

Radial cell triangular at apex, with hardly any trace of appendix. Second cubital cell sessile, triangular, recurrent nervures not quite interstitial, near to the apex.

Black, with the markings as stated in the diagnosis. The ivory-coloured bands cover the greatest part of the upper side of the abdomen. Only the base of the first tergite is black; the pale bands of the second and third tergites are broad, and leave only small margins of the segments ferruginous. Fourth and fifth tergites are nearly covered by the bands. The pygidial area and the sides and apex of the pygidial segment as well as the venter are ferruginous. Scapulae brown.

This species is of the same habitus as *P. handlirschi*, but broader and thicker. It has all the characteristics of the group. The different distance of the eyes at the vertex separates it sufficiently from *P. handlirschi*.

I have great pleasure in naming the species in honour of Mr. Rowland E. Turner, of the British Museum.

Willowmore, Cape Colony ; January ; 1 ♀ . Type in my collection.

Both species have no appendix to the radial cell, and agree in this respect, as well as in the absence of the lateral keels of the first tergites, with *P. latifrons*, Kohl ; but in that species the radial cell is subtruncate, almost rounded at apex, while in the two species described above it is triangularly pointed.

LXXIII.—*New Species of Heterocera from Costa Rica*.—XVI. By W. SCHAUS, F.Z.S.

*Pyralidæ*.

Subfamily *EPIPASCHINÆ*.

*Pococera albimedium*, sp. n.

♀. Palpi black, shaded with white. Frons fuscous brown, irrorated with white. Vertex white. Collar and thorax white, shaded with brownish buff, and with a few scattered black scales. Abdomen above white, with broad transverse black lines, partly suffusing. Fore wings: base broadly dark olive, irrorated with black, and crossed by a broad white line, outbent on inner margin, inwardly edged with black and outwardly expanding between cell and submedian, and also edged with black except below submedian ; medial space to outer line white, with a black point at end of cell, dark spots on costa, and some pale brown and black irrorations postmedially ; outer line fine, black, inbent at vein 4, outwardly finely edged with white ; terminal space black from costa to vein 5, the termen slightly irrorated with white ; below vein 5 a mottled olive and reddish subterminal shade ; terminal black spots. Hind wings dirty white ; a post-medial fuscous line marked with black on vein 2 ; a marginal fuscous shade widest at apex ; a terminal black line.

Expanse 22 mm.

*Hab.* Juan Vinas.

Near *P. albimedialis*, Hmps. n.

*Pococera beroella*, sp. n.

♂. Palpi brown, ringed and tipped with white. Head and thorax greyish brown, with slightly darker shadings. Abdomen dark grey, with pale segmental lines. Fore wings: basal third light brown, limited by a geminate, black-brown, lunular, antemedial line, filled in below cell with white; a black spot at base of costa, followed by a greyish shade; a black streak below cell before antemedial; space beyond to subterminal whitish grey, the costa and veins irrorated with brown; a faint medial brownish line from vein 3 to inner margin, followed by a pale brown shade to subterminal, which is white, lunular, and sinuous, defined by brownish shadings on either side, and inwardly also with dark streaks on veins; an apical dark brown shade and terminal dark brown line, interrupted by white points on veins. Hind wings whitish, shaded with fuscous grey.

Expanse 21 mm.

*Hab.* Juan Vinas.

The antennæ of female also with short fascicles.

*Pococera irrorata*, sp. n.

♀. Palpi dark grey. Head and collar white, shaded with brown. Thorax dark grey; patagia white, with a few dark irrorations. Abdomen buff-grey, with segmental shades consisting of dark irrorations. Fore wings whitish grey, thickly irrorated with darker grey, and a few scattered black scales; a small fuscous-brown spot at base of costa; a fine subbasal line, curved on costa, inbent in cell to median; a fuscous-brown antemedial shade on costa and vague line across cell; a black medial spot on costa and sinuous outbent line to inner margin just beyond middle; an outer dentate fuscous shade, outset between veins 3 and 5, followed by a grey spot on costa, and narrow greyish shade from vein 5 to inner margin; a subterminal dentate brown shade; termen irrorated with brown; an interrupted terminal brown line. Hind wings dirty white, the termen shaded with fuscous brown. Fore wings below silky fuscous brown. Hind wings below as above; traces of a fine postmedial line.

Expanse 20 mm.

*Hab.* Sixola.

*Pococera crinita*, sp. n.

♀. Palpi with the second joint very long, fringed behind with long hair, dark purplish brown, streaked below, at base.

with buff. Body brown, tinged with lilacine. Fore wings lilacine brown; an antemedial straight fuscous-brown line, preceded by a paler lilacine brown shade, and followed by an olive-brown shade limited by a pale medial line faintly outbent; an oblique black spot at end of cell edged with lilacine; a postmedial dark olive-brown shade from below costa, inbent below end of cell, and expanding; an outer broad whitish-buff line inwardly edged by a fine fuscous-brown line, and outwardly followed by a dark brown shade; a terminal black line with pale points at veins; cilia pale reddish brown, tipped with lilacine. Hind wings fuscous brown; cilia fuscous grey tipped with white, and with a basal reddish line at apex. Wings below fuscous; apical half of costa on fore wings and apex of hind wings shaded with dull red.

Expanse 22 mm.

*Hab.* Esperanza, Guapiles.

*Pococera elegans*, sp. n.

♂. Palpi buff, streaked in front with black. Head, collar, and thorax pale buff; the antennal process, which is very long, terminally shaded above with reddish brown. Abdomen buff; a reddish dorsal line to beyond middle; fuscous segmental lines on terminal segments. Fore wings grey; basal third of costa fuscous brown; a fine black line above median near base, thickening below cell antemedially, below which the basal half of wing to inner margin is pale buff shaded with pale brown, the whole limited by a sinuous, outbent, fuscous-brown medial line; a fine fuscous streak at end of cell and a dark shade on costa above it; a faintly darker grey outer shade; subterminal dark streaks on veins 7 and 8; a fine terminal dark line. Hind wings dirty white; costal margin greyish; postmedial dark streaks on veins, most noticeable on vein 2; a terminal dark line. Fore wings below fuscous grey; a faint darker outer line followed by a whitish spot on costa. Hind wings below whitish; a dark spot on discocellular in front; a faint postmedial shade, heavy on costa. The costa of both wings shaded with reddish brown.

Expanse 24 mm.

*Hab.* Juan Vinas, Sixola.

The fore wings have veins 4 and 5 approximated for nearly half their length; no groove in cell or fringe below costa.



*Pococera marmorata*, sp. n.

♂. Palpi very long, with slight tuft of hair on inner side of second joint at extremity. Antennæ with moderate process and long fasciculate cilia. Palpi grey. Head and thorax dull grey; collar shaded with brown. Abdomen dull dark grey. Fore wings: basal third buff-brown, crossed by an outbent whitish shade, the outer portion heavily irrorated with black on costa, in and just below cell, then to inner margin the irrorations form an indistinct geminate line; medial space whitish, crossed by a fine fuscous line, somewhat incurved below cell and close to basal space; costa beyond this line to outer line pale reddish brown; inner margin to outer line grey; some black irrorations form an indistinct postmedial line from below costa, inbent from vein 5 to below cell before vein 2, angled and only reaching submedian; these irrorations followed by a reddish-brown space to outer line, which is fuscous, lunular, and outcurved from vein 6-3, and is outwardly edged by the broader white subterminal line; termen grey, shaded with reddish brown at apex; terminal black spots. Hind wings white; terminal dark points; a fuscous shade at apex and traces of a subterminal line on costa.

Expanse 28 mm.

*Hab.* Poas.

Fore wings: veins 4 and 5 approximated; no groove in cell or fringe of scales below costa.

*Pococera notabilis*, sp. n.

♀. Palpi buff-brown, dusted with grey. Head, collar, and thorax brownish buff, the latter with some dark scales behind. Abdomen ochreous buff; dark segmental shades. Fore wings: base for more than one-third brownish buff, irrorated with black outwardly and on inner margin, limited by a broad white line, faintly indentate on submedian; outer space fuscous brown, thickly irrorated with white; a subterminal whitish dentate line edged with clearer fuscous brown; a terminal black line interrupted by veins. Hind wings whitish brown, the outer margin shaded with fuscous; cilia fuscous, tipped with white.

Expanse 23 mm.

*Hab.* Juan Vinas.

*Pococera olivescens*, sp. n.

♂. Palpi long and smoothly scaled. Head, collar, and

thorax pale olive-green. Abdomen grey, with darker transverse shades. Fore wings olive-green; an antemedial greenish-white shade, not reaching inner margin, and a similar basal line; some black scales on medial space in cell and on inner margin; a whitish shade at end and just beyond cell, on which the black oblique line on discocellular is conspicuous, also below cell to submedian fold, outbent towards outer line, which is greenish white, straight from costa to vein 4, then outcurved, followed by blackish irrorations from vein 4-8; an interrupted terminal fuscous line. Hind wings whitish, the termen narrowly fuscous.

Expanse 23 mm.

*Hab.* Esperanza.

#### APOCERA, gen. nov.

Palpi upturned, the second joint reaching vertex of head, the third short; maxillary palpi in fold of labial palpi; antennæ of male fasciculate, with short process; tibia very slightly hairy. Fore wing with veins 4 and 5 from cell, shortly approximated; 6 from upper angle; 7, 8, 9 stalked, 10 and 11 free. Hind wing with vein 3 from angle of cell; 4, 5 stalked; 6, 7, from upper angle, 7 anastomosing with 8.

#### *Apocera costata*, sp. n.

Palpi lilacine buff, fringed with black. Head, collar, and thorax whitish buff, the collar shaded in front with brown. Abdomen above brown, with dark irrorations. Fore wings: the anterior half to subterminal whitish buff, the costa slightly tinged with lilacine and darkly irrorated medially; a fuscous-brown spot near base of costa and a fine streak below cell; a fuscous-brown shade from base along inner margin, upcurved antemedially to above submedian, and followed by a whitish shade; a black point on discocellular; outer half of inner margin to below cell and vein 4 brown, with fuscous-brown postmedial streaks on veins 2 and 3, and shorter streaks on veins 4 and 5; subterminal fuscous-brown, lunular, oblique from costa, and suffusing with dark brown terminal shade between veins 5-2; apex and tornus irrorated with white. Hind wings whitish, the veins pale brown; the apex shaded with fuscous.

Expanse 18 mm.

*Hab.* Esperanza.

*Jocara chlorisalis*, sp. n.

♂. Palpi light brown. Antennal process buff, irrorated and tipped with reddish brown. Collar dorsally reddish brown, outwardly green. Thorax greenish, the patagia tipped with reddish brown. Abdomen brown-buff, with a few black irrorations. Fore wings green; a black spot at base of costa and point below cell; an antemedial black spot on costa, and fascia from cell to inner margin, preceded by a small tuft of white scales below median; a black medial spot on costa and line outangled in cell to black discocellular streak, close to antemedial fascia from median to inner margin; an angled postmedial shade from beyond cell not reaching submedian; postmedial lunular, dentate, straight on costa, then slightly outcurved, black, outwardly shaded with pale green; terminal black spots. Hind wings smoky white; outer margin fuscous, widest at apex. Wings below luteous white; costal margin pale buff, thinly irrorated with reddish. Fore wings: a fuscous line on discocellular and slightly curved outer shade; termen shaded with fuscous. Hind wings: apical half of outer margin shaded with fuscous; a fine indistinct subterminal line, more heavily marked on costa.

Expanse 28 mm.

♀. Fore wings: the lines finer; the antemedial reduced to a line marked by a small spot below median; costal spots smaller. Hind wings fuscous brown. Fore wings below fuscous, the inner margin white but not reaching termen; costa as in male. Hind wings below luteous; a black discal point; outer line well marked, wavy towards inner margin; outer margin shaded with fuscous from costa to vein 2.

Expanse 29 mm.

*Hab.* Juan Vinas, Sitio, Tuis.

*Jocara nana*, sp. n.

♂. Antennal process long. Palpi light brown, with fuscous rings terminally. Process brown. Thorax buff. Abdomen buff-brown; fine whitish segmental lines interrupted by small black dorsal spots. Fore wings light brown; some scattered black scales on basal third; a fuscous line along inner margin to antemedial, which is whitish and only traceable from below cell; medial line also whitish and from cell; the space between the lines on inner margin fuscous; a fuscous spot at end of cell partly edged by a pale line; the outer line pale, defined by a black shade on its

inner edge, lunular, somewhat oblique from costa to vein 3, then incurved to submedian, outangled, and inbent on inner margin; termen shaded with fuscous brown, darkest at apex; fuscous terminal spots. Hind wings fuscous brown, darkest on termen. Hind wings below dirty white, the termen fuscous, narrowing to anal angle; a fuscous discal spot.

Expanse 15 mm.

*Hab.* Juan Vinas.

*Jocara nigripuncta*, sp. n.

♂. Antennæ with long process. Body and fore wings brownish buff; collar outwardly shaded with fuscous; abdomen irrorated with fuscous brown. Fore wings: some fuscous irrorations; a small spot below middle of cell; a round black spot at end of cell, followed by a black streak between veins 5 and 6 to outer line, which is fuscous brown, lunular dentate, and evenly outcurved, outwardly pale shaded; terminal black spots. Hind wings semihyaline brownish white, the termen irrorated with fuscous and reddish brown.

Expanse 31 mm.

*Hab.* Juan Vinas.

*Jocara noctuina*, sp. n.

♂. Palpi, head, and collar buff-brown. Thorax lilacine brown, the patagia tipped with fuscous. Abdomen buff, with black irrorations, forming segmental shades. Fore wings buff; costa shaded with dull green; basal third shaded with dull green and grey on inner margin, limited by a slightly curved thick velvety black line, outwardly shaded with dark brown from cell to inner margin; a velvety black spot on discocellular; outer line fine, fuscous, inbent on costa, then outcurved to vein 4, below which it is incurved to fold, and nearly vertical on inner margin; an interrupted terminal black line. Hind wings buff-white; a black line on discocellular; fuscous shading on costa and apex; an interrupted fine terminal black line. Hind wings below: a fuscous shade on costa near base; a black streak on discocellular; a postmedial fuscous line on costal margin; the terminal line as above.

Expanse 26 mm.

*Hab.* Sixola.

Like *J. brachypalpia*, Dogn.



*Jocara obscuralis*, sp. n.

♀. Head, collar, and thorax buff-brown, the thorax tinged with lilacine. Abdomen buff-brown, with black segmental shades. Fore wings mostly dark lilacine brown; basal third of costa mottled dark green and black; basal third of cell, median and submedian veins irrorated with black; a vague antemedial black shade on costa and cell, and an inset whitish point below cell; costa medially and postmedially greenish yellow, crossed by a duller green shade; a yellowish streak medially on submedian, partly shaded with grey scales; a broad postmedial shade from below costa, outangled and extending on veins, consisting of streaks only on veins 3, 2, and fold; a subterminal yellow-green streak on costa and grey points on veins, preceded by black points connected by an almost imperceptible fuscous line, and followed by black shades, suffusing towards and on costa; termen narrowly yellowish green: an interrupted terminal black line; cilia roseate, mottled with fuscous. Hind wings shaded with fuscous brown, darkest terminally; cilia whitish, shaded with roseate towards apex, and with some fuscous spots. Fore wings below fuscous, the costa and termen broadly roseate brown; a subterminal white spot on costa. Hind wings below: a black point on discocellular at vein 6; outer line and apex roseate brown, the former fine, obliquely curved to vein 5, then punctiform.

Expanse 28 mm.

*Hab.* Juan Vinas.

Near *J. ferrifusalis*. Hmps., which also occurs in Costa Rica.

*Jocara subcurvalis*, sp. n.

♂. Palpi brown. Head and collar buff, with a medial brown line. Patagia and abdomen buff, the latter irrorated with dark brown, and with pale segmental lines. Fore wings buff-brown, shaded with dark brown, chiefly on outer third; base of costa and inner margin darker shaded; a broad antemedial fuscous shade, closely followed by the medial fuscous-brown line, which is angled on subcostal; a fuscous streak on discocellular; outer line fuscous, lunular dentate, inbent on costa, outcurved below it, the veins before and beyond it shortly streaked with reddish brown; a subterminal darker shade, widest on costa; a terminal black line, interrupted by buff points on veins; some green shading on termen; cilia with fuscous spots. Hind wings dirty

white, shaded with fuscous on outer margin; traces of a postmedial line. Wings below dirty white: black discal points. Fore wings: the costa whitish buff, irrorated with red; the postmedial fuscous line straight on costa, then outcurved; termen shaded with fuscous brown. Hind wings: postmedial line incurved on costa, then outcurved; the apex shaded with fuscous brown.

Expanse 25 mm.

Female: the wings tinged with green; a short black antemedial streak below cell; postmedial space and apex shaded with reddish brown. Hind wings shaded with fuscous.

Expanse 30 mm.

*Hab.* Juan Vinas.

In B. M. from Jalapa, Mexico.

*Jocara subfusca*, sp. n.

♀. Palpi lilacine brown, streaked below with pale buff. Head brown, outwardly lined with buff. Thorax fuscous, the patagia and collar lilacine buff. Abdomen pale brown, with darker irrorations. Fore wings: basal half green on costa and in cell, below cell lilacine brown, darker shaded on inner margin; an antemedial short dark streak in cell and small tuft of dark brown scales below median; the outer edge of brown space lunular and closely followed by a nearly straight dark brown medial line, edged from below cell to inner margin with roseate buff, interrupted on subcostal; a minute dark streak at end of cell edged with silvery grey scales; a fuscous postmedial line from below costa, irrorated with silvery-grey scales; space beyond tinged with brown to near termen and crossed by the fuscous outer line, which is followed by a brownish-buff shade and then some fuscous irrorations; an interrupted terminal black line. Hind wings fuscous brown, darkest on termen; cilia fuscous grey tipped with white. Wings below fuscous; the postmedial line and termen darker; black discal points; some grey irrorations on costa beyond cell and in cell of hind wings.

Expanse 23 mm.

*Hab.* Sixola.

Near *J. ferrifusalis*, Hmps.

*Jocara tenebrosa*, sp. n.

♂. Palpi buff, partly fringed with dark brown. Head whitish buff. Collar and thorax dull reddish brown. Abdomen fuscous grey, with pale segmental lines. Fore wings

dull slate tinged with lilacine brown, especially above submedian to near cell and vein 4; a broad buff antemedial shade, irregular and indented from costa; a similar subterminal line, indented on costa, outcurved below it, broad from veins 8-6, then finer and dentate; a darker shade on discocellular. The anterior half of wing indistinctly shot with greenish blue. Hind wings thinly scaled, fuscous brown, faintly tinged with purplish. Fore wings below fuscous; the inner margin greyish; costa shaded with reddish; the outer line only noticeable on costa. Hind wings below whitish, shaded with fuscous; a black discal point; costa shaded with reddish; a postmedial fuscous line.

Expanse 27 mm.

♀. Fore wings olive-brown, broadly darker before outer line; a dark streak from near base along median, interrupted by an antemedial cluster of whitish scales, and followed by a pale lunular inner line, very confused and indistinct; a black crescent-shaped line on discocellular, edged with whitish irrorations; the outer line buff, lunular dentate, of even thickness. Hind wings fuscous brown, not so broad as in male.

Expanse 26 mm.

*Hab.* Sixola.

*Jocara terrenalis*, sp. n.

♀. Palpi whitish buff, shaded with brown. Frons dark grey. Vertex pale buff. Collar dark reddish brown, irrorated with black; a dorsal buff shade. Thorax dark grey; patagia buff. Abdomen olive-buff, irrorated with fuscous. Fore wings: costal margin and apex buff, shaded with pale green; cell and basal half below cell buff-grey, with reddish and black irrorations; a dark streak on inner margin at base; medial line fine, fuscous, lunular and indistinct; a black discal point; outer space below and beyond cell, also to termen below vein 3, fuscous brown; outer line straight on costa, outcurved below it, lunular dentate, inwardly shaded with fuscous, outwardly with dark olive; terminal black spots. Hind wings smoky white, shaded with fuscous brown, darkest on termen. Fore wings below fuscous brown; costa buff to postmedial; veins terminally reddish; inner margin narrowly white. Hind wings below whitish; costa with some reddish and brown irrorations; termen shaded with fuscous; a subterminal fuscous line, incurved on costa.

Expanse 29 mm.

*Hab.* Sixola.

*Jocara translinea*, sp. n.

♀. Palpi, head, and thorax olive-green; collar and ptagia tinged with reddish buff. Abdomen olive-buff, with some darker irrorations. Fore wings pale green; a buff shade below costa to antemedial; the inner margin to antemedial lilacine brown, with darker irrorations; beyond base, below median, a streak of long downturned fuscous-brown scales; antemedial outcurved on costal margin, faint, fuscous, closely followed by a more distinct, nearly straight, fuscous medial line; the narrow space between lines below cell whitish; a black point at end of cell; a faint postmedial brownish line, and the space beyond to outer line faintly tinged with brown; outer line fine, black, lunular dentate, straight on costa, then outcurved; very small terminal black spots. Hind wings whitish, shaded with fuscous, the veins darker; traces of a paler postmedial line; an interrupted terminal fuscous line. Wings below: the postmedial line oblique from costa and angled at vein 5. Fore wings reddish brown; the costa whitish buff, irrorated with pale red. Hind wings whitish; a black point on discocellular; the apex shaded with reddish brown.

Expanse 27 mm.

*Hab.* Juan Vinas.

A male in B. M. from French Guiana.

*Chloropaschia canities*, sp. n.

♂. Palpi buff-brown, shaded with dark brown laterally. Frons brown. Collar mottled slate-grey, brown, and black. Thorax silvery grey. Abdomen luteous buff. Fore wings for two-thirds from base whitish grey, irrorated with olive, somewhat darker shaded at base; a fine dark line on discocellular; a medial small fuscous shade on costa and one postmedially, from which faint lines extend to below discocellular, and then form a distinct olive-brown geminate line, outangled below vein 2 and inbent to middle of inner margin; outer third olive-brown; small fuscous postmedial spots on vein 2 and submedian; a darker brown subterminal geminate shade, divided by whitish shading from vein 4 to inner margin; termen shaded with grey chiefly above tornus; a terminal black line, partly intersected by veins; cilia buff, shaded with fuscous spots. Hind wings brownish white; apex and termen shaded with fuscous; a fuscous line at base of cilia.

Expanse 28 mm.

*Hab.* Sixola.



*Macalla claphcalis*, sp. n.

♂. Palpi, head, and collar reddish brown, crossed from antennae by an outbent whitish line. Thorax dark brown; patagia buff-brown. Abdomen buff-grey, with transverse fuscous shades. Fore wings: base buff from costa to submedian, streaked with reddish brown in and below cell, and a small similar spot at base of costa, the whole limited by a dark reddish-brown shade irrorated with black and outwardly edged by a lunular black line, followed by a narrow white shade, all inbent from costa to submedian; inner margin and outer space olive-grey irrorated with whitish; postmedial black streaks on veins, connected by a faint fuscous shade; outer line whitish, lunular dentate, finely edged with fuscous, oblique from costa to vein 5, then parallel with outer margin, followed above vein 5 by a dark brown shade and fuscous streaks on veins; a terminal black line with white points at veins; cilia whitish spotted with black. Hind wings semi-hyaline whitish; costal margin and apex shaded with fuscous grey; the inner margin tinged with buff; a terminal black line.

Expanse 29 mm.

Hab. Sixola.

*Macalla marginata*, sp. n.

♀. Body buff, the palpi and abdomen irrorated with reddish. Fore wings buff; extreme costa finely dark brown; a fine dark brown shade along inner margin, expanding medially into a broad spot upturned to submedian fold; a medial black streak on costal margin; faint brownish streaks on interspaces postmedially to outer line, which is black, finely lunular dentate and evenly outcurved, followed by minute pale streaks on veins; outer margin dark brown, with a darker subterminal line parallel with outer line; termen irrorated with grey-buff, chiefly at apex. Hind wings buff-white; outer margin shaded with fuscous brown; some subterminal pale points on veins.

Expanse 23 mm.

Hab. Sixola.

*Macalla nebulosa*, sp. n.

♀. Palpi dark brown. Frons silvery grey. Vertex brown. Collar and thorax grey, the collar shaded in front with orange. Abdomen buff; lateral broad fuscous shades, meeting dorsally on last segments. Fore wings silky grey, irrorated and shaded with fuscous brown, especially at base

and on outer margin ; the basal space limited by an irregular black shade, closely followed by a black point in cell ; a large spot on discocellular ; outer line fuscous, oblique from costa, inbent at vein 4, somewhat curved and followed by streaks on vein 3 and fold and a deep yellow spot on costa ; terminal black spots ; cilia buff-brown, spotted with black from vein 4 to apex. Hind wings dirty white, shaded with brown, darkest on outer margin ; an outer dark line. Wings below luteous white ; black discocellular lines ; heavy fuscous postmedial lines, outbent from costa and sharply rounded at vein 4 ; broad fuscous-brown shades at apices.

Expanse 25 mm.

*Hab.* Avangarez.

Near *M. superatalis*.

*Macalla selecta*, sp. n.

♀. Palpi black, tipped with white. Head, collar, and thorax dark brown ; patagia mottled with dark grey. Abdomen pale grey, with greyish-brown transverse shadings. Fore wings : basal half dark brown, with a faint lilacine-grey antemedial shade ; a black point in cell and short black streak below cell ; a fuscous geminate medial line divided by a lilacine grey line, slightly outcurved around a velvety black discocellular spot ; medial line followed by a broader lilacine grey shade, outwardly edged with reddish brown and then dull olive to outer line ; outer line fuscous, barely outcurved below costa, outwardly pale-edged ; this is followed by a reddish-brown shade, widest on costa ; termen lilacine grey ; terminal fuscous-brown spots. Hind wings white, suffused with greyish brown and shaded with fuscous on outer margin.

Expanse 30 mm.

*Hab.* Sixola.

*Locastra viriditincta*, sp. n.

♂. Palpi and head purplish brown, mottled with buff ; process medially black, broadly green at end. Collar and patagia black, tipped with green. Abdomen brownish buff, thinly irrorated with fuscous grey. Fore wings purplish brown, shaded with fuscous, the outer half of inner margin broadly, and termen green ; a medial green spot on costa between a fine geminate fuscous line, slightly inangled on submedian ; a faint brown-buff shade antemedially below cell and a black point in cell ; a velvety-black streak on discocellular, pale-edged, and a fine line of raised scales

below it across vein 2; an oblique line of similar raised scales beyond cell; outer line buff, slightly oblique on costa, preceded and followed by darker shading, then faintly out-curved from vein 6, below vein 5 preceded by a fine, deeply lunular, dentate, black line, and followed by black-angled spots; an interrupted terminal black line; cilia buff-green, shaded with darker green. Hind wings white, costa, apex broadly, and termen narrowly fuscous, a subterminal fuscous line; inner margin and cilia roseate buff, becoming reddish at apex.

Expanse 33 mm.

*Hab.* Juan Vinas, Sixola, Turrialba.

*Stericta apicalis*, sp. n.

♂. Palpi light reddish brown. Collar and thorax greyish, mottled with dull olive; a black spot on patagia anteriorly. Abdomen buff-brown, irrorated with black, forming irregular segmental lines. Legs grey-brown, broadly ringed with fuscous; fore femora white, shaded with black near throat. Fore wings: base, inner and outer margins, and postmedial space below vein 2 mottled roseate brown and olive-green; a small black spot at base of costa; antemedial space broadly whitish grey, not reaching inner margin, limited by an indistinct lunular white medial line, outset below cell; postmedial space shaded with fuscous; a black line on discocellular; subterminal line straight on costa, then slightly outcurved to vein 2, and straight on inner margin, paler, preceded by small black spots almost forming a line, and followed by a fine whitish shade on inner margin; a terminal white space from vein 5 to apex; a terminal black line interrupted by veins; cilia greenish buff mottled with black. Hind wings whitish brown, darker shaded on outer margin; veins pale brown, with darker subterminal streaks on veins. Fore wings below roseate brown, the inner margin whitish; a black point on discocellular, followed by a deeply dentate fuscous shade. Hind wings below whitish, the costal margin irrorated with roseate brown; a black discal point; a roseate brown subterminal line, deeply dentate on anterior half.

Expanse 34 mm.

*Hab.* Juan Vinas, Sitio.

The female has the antemedial space and hind wings shaded with fuscous.

*Stericta umbrosalis*, sp. n.

♂. Palpi, head, collar, and thorax green, some black

irrorations on collar and patagia. Abdomen buff, shaded with brown dorsally. Fore wings green, markings black; a small spot at base of costa and a larger one antemedially; a broad antemedial spot, irrorated with reddish from cell to inner margin, its inner edge indentate on submedian, its outer edge twice lunular, closely followed by a fine medial line terminating in a spot on costa; a line at end of cell; a postmedial line from costa to submedian fold, outbent between veins 4 and 5, followed by a fuscous-brown shade irrorated with red to outer line, which is straight on costa, then out-curved, lunular dentate, geminate, filled in with dull green; an interrupted terminal line. Hind wings whitish, the outer margin fuscous; outer dark fuscous streaks on veins.

♀. Palpi fuscous brown. Head, collar, and thorax mottled reddish brown, dark grey, and green. Fore wings green; costal spots and terminal space from postmedial dull purplish brown, on which the outer line is very indistinct; antemedial spot on inner margin more linear; a black lunule on discocellular; the costal margin yellowish, irrorated with pale reddish brown. Hind wings as in male.

Expanse, ♂ 31, ♀ 30 mm.

Hab. Juan Vinas, Turrialba.

*Isolopha basilata*, sp. n.

♀. Palpi and frons pale buff. Vertex, collar, and thorax buff, medially tinged with lilacine brown. Abdomen rufous brown. Fore wings: a little less than basal half from costa to just below cell pale buff, streaked with pale lilacine brown, otherwise dull black irrorated with brown and roseate buff; a velvety-black streak below cell before middle; a geminate medial fuscous line, defined by a pale brownish line dividing it, lunular and inbent below cell; discal streak velvety black-brown, very slight; an indistinct postmedial sinuous line, the space before it greenish brown, the space beyond darker; outer line green, cut by black veins and shaded with black on either side, the outer shading with white points on veins; outer margin narrowly green; a terminal interrupted lunular black line. Hind wings whitish at base, shaded with fuscous; traces of a postmedial line.

Expanse 31 mm.

Hab. Juan Vinas.

Subfamily HYDROCAMPINÆ.

*Argyractis albibasalis*, sp. n.

♂. Palpi, head, and collar brownish grey. Thorax



white. Abdomen above pale brown. Fore wings silvery white; costa brown-grey; medial space fuscous brown, expanding outwardly along vein 5 shortly, and then obliquely curved to tornus; two fuscous-brown outer lines from costa, suffusing at vein 2; a terminal yellow line from below apex to near tornus, where it is shortly inbent. Hind wings: base silvery white; a medial fuscous-brown shade, followed by a white spot and dense fuscous-brown irrorations to terminal spots, which are black, edged with metallic roseate and lilacine scales; an orange-brown terminal shade near anal angle.

Expanse 15 mm.

*Hab.* Juan Vinas.

*Argyraetis auspicatalis*, sp. n.

♀. Palpi buff, tipped with white. Body white; collar outwardly shaded with brown; thorax and abdomen irrorated with brown. Fore wings white; basal half of costa and part of cell thickly irrorated with brown, forming a dark shade with its hind edge somewhat curved, the inner margin with only a few brown scales, the whole limited by a white line, broadest below cell, and preceded on inner margin by a small yellowish spot; a medial brown line from costa, not reaching median, followed by a buff shade on costa and some brown irrorations below it; discocellular defined by two oblique brown lines; a brown shade beyond cell suffusing with postmedial line, which is slightly outbent from costa to vein 3; postmedial space below cell and vein 3 yellow-buff, interrupted by a white shade on inner margin; an oblique silvery white streak from below discocellular to inner margin before tornus and an opalescent spot at tornus; postmedial line followed from costa by a silvery-white streak; the sub-terminal brown from costa to vein 6, then yellow-buff, followed by a silvery-white line to below vein 2, finely edged with fuscous; termen yellow-buff; cilia grey. Hind wings white; a medial yellow-buff spot, not reaching below vein 2, followed by opalescent white and preceded by a few brown scales in cell; a postmedial yellow-buff line expanding towards costa and extending to termen below vein 2; a sub-terminal white space; crossed by a fine wavy yellow-buff line from near apex to vein 5; three or four terminal black spots outwardly edged and separated by silvery scaling, also preceded by a black line, forming two deep lunules above each spot; a fine brown streak near inner margin and small brown spot near angle.

Expanse 16-28 mm.

*Hab.* Juan Vinas, Tuis, Esperanza, Guapiles.

*Argyractis amethystina*, sp. n.

♀. Head, collar, and thorax white, the collar outwardly fuscous grey. Abdomen dorsally white at base and on seventh and eighth segments, otherwise shaded with fuscous grey. Fore wings white; costa on basal third and antemedial shade broad and inbent on inner margin, olive-brown, the latter closely followed by an inbent medial line from costa to submedian; costa medially buff, shaded with brown; reniform outlined by a geminate olive-brown line, sometimes meeting behind; an outbent similar postmedial shade from costa to vein 3, followed by a broad white shade; a subterminal silvery-white line, faintly edged with dark grey and preceded by a brown and yellowish shade; termen yellow; outer space from below cell before discocellular to inner margin yellow, with a terminal horizontal silvery streak below fold. Hind wings white; a broad antemedial grey-brown space, expanding on inner margin towards angle and crossed by a whitish streak just below cell; a medial yellow spot above vein 2, the white following it opalescent; outer portion of wing above vein 2 yellow, its inner edge vertical; a terminal black space, on which are annular metallic lines, preceded by a narrow white space, crossed by a brown line between veins 6 and 7.

Expanse, ♂ 12, ♀ 17 mm.

*Hab.* Esperanza, Guapiles, Carillo.

*Argyractis nitens*, sp. n.

♀. Body white; subdorsal brown spots on second segment of abdomen. Wings silky white. Fore wings: a fuscous-brown spot on costa and one on inner margin near base; an oblique brownish antemedial shade on inner margin and faint trace of similar shade on costa; a medial fuscous-brown spot on costa and fine vertical medial brownish line, slightly inbent on inner margin; two short oblique brown lines at discocellular, from inner one a fine brown line incurved, then outwardly oblique, and downcurved on inner margin; a postmedial brown line outbent from costa to vein 4, where it is slightly hooked; a subterminal brown shade, wide on costa, narrowing to vein 2, then inbent along it and expanding; below it and vein 2 an orange line upturned along termen and not quite reaching apex, inwardly edged along termen by a fine fuscous line; a marginal dark grey streak along submedian fold to tornus, and below it a yellow spot on inner margin; cilia grey, tinged with fuscous at base and

at apex. Hind wings: a medial narrow brown shade; a downbent fine postmedial line, followed by another fine line on discocellular, outbent at vein 5, and irregular to near apex; small marginal black spots, well circled with metallic scales, which cover termen, inwardly the metallic edging preceded by a fine lunular black line; termen orange at apex.

Expanse 21 mm.

*Hab.* Tuis.

Near *A. chalcistis*, Dogn.

*Argyractis parvissimalis*, sp. n.

Body brown; abdomen crossed by fuscous-brown shades. Fore wings grey-buff, with darker irrorations; a faint paler medial shade, followed on costal half by a broad fuscous shade; postmedial faint, whitish, outbent to near subterminal at vein 4, sharply angled and upbent towards discocellular; subterminal white, separated from terminal orange shade by a fine dark line; the terminal orange shade not extending below vein 3. Hind wings grey-buff, with medial, post-medial, and subterminal fuscous shades; the terminal black spots small, edged with metallic scales, and separated, the spots nearest apex especially so.

Expanse 10 mm.

*Hab.* Juan Vinas.

*Argyractis peraltalis*, sp. n.

♂. Palpi buff, shaded with steel-grey. Body buff; thorax behind and base of abdomen shaded with brown; second segment dorsally fuscous grey, third white. Fore wings: base dark brown, its outer edge oblique, formed by a whitish-yellow space, broad on inner margin, outwardly limited by a vertical medial line, dark brown on costa and cell, orange below it; outer space below cell and vein 3 mostly orange, with some yellowish white on inner margin and at tornus; anterior space beyond medial line dark brown, with a white shade on discocellular, an outbent white postmedial line, and a submarginal white line from costa to vein 2; termen yellow; cilia fuscous brown. Hind wings: base white, with a large brown spot between cell and inner margin, otherwise orange, with two large terminal spots cut by metallic lilac lines, the anterior spot only slightly surmounted with white; a short postmedial white streak.

Expanse 10 mm.

*Hab.* Peralta.

*Argyractis puralis*, sp. n.

♀. Body and wings white. Fore wings: a black point on base of costa; three fuscous-brown subbasal spots in an inbent row from costa; a brown shade medially on costa, an inbent fine brownish line below it to submedian; postmedial line fine, pale brown, very much outbent and curved, almost reaching termen, inbent along vein 3 to discocellular, then sinuous and vertical to inner margin; a brownish shade along costa above postmedial; apex acute, somewhat falcate; termen yellow from vein 5 to apex, inwardly edged by a brown line. Hind wings: a fine antemedial brownish line; a sinuous fine subterminal line.

Expanse 20 mm.

*Hab.* Juan Vinas, Carillo.

*Argyractis tristalis*, sp. n.

♀. Body grey-brown; abdomen slightly darker at base and terminally, with faint pale segmental lines. Fore wings grey-brown; a dark subbasal shade; a slightly darker medial shade, angled on costa and slightly inbent; a faint ochreous line on discocellular, finely darker edged; outer line remote, straight on costa, slightly outcurved and inbent to before discocellular, angled and outcurved to inner margin as a postmedial line, and is fine, indistinct, outwardly pale shaded; small terminal fuscous spots. Hind wings white; a sinuous medial fuscous line, expanding, and darker on inner margin at angle; a faint subbasal shade; a fine subterminal, wavy, dentate line; a terminal narrow ochreous shade, finely edged with dark grey.

Expanse 23 mm.

*Hab.* San José.

Near *A. cineralis*, Schs.

*Argyractis triumphalis*, sp. n.

♀. Body whitish buff; frons shaded with dark grey, the collar outwardly with brown, the abdomen dorsally with buff-brown. Fore wings: base to near middle greyish brown anteriorly, on inner margin somewhat browner, limited by an inbent whitish shade, and dark brown medial line from costa to submedian; beyond this buff-brown on costa; a white streak through end of cell, downbent beyond it; below cell whitish, suffused with yellow to inner margin and termen, but interrupted by a small white spot postmedially below vein 2 and an opalescent spot at tornus: a postmedial brown



shade on costa, tapering to a point at vein 3, followed by a white line joining the downbent line from cell; a brown and yellow subterminal thick line from costa to vein 2, followed by a silvery-white line; the termen yellow; cilia grey, with a fuscous line at base. Hind wings white, basal half of cell and inner margin shaded with brown; a postmedial yellow spot, preceded and followed by an opalescent white streak; outer space above vein 2 yellow, with the usual terminal black space cut by metallic lilac scales, and inwardly preceded by a small white space from veins 5-7, crossed by a black line between 6 and 7; the black spot nearest vein 2 surmounted by opalescent blue and roseate scales.

Expanse, ♂ 11, ♀ 16 mm.

*Hab.* Esperanza.

The male has inner margin of hind wings without brown shading.

*Argyraetis volcanalis*, sp. n.

♀. Palpi whitish buff. Head white. Collar dull grey-brown in front, shaded behind with yellowish white. Thorax white, patagia tipped with yellow-buff. Abdomen above buff-brown, the second segment dark grey; faint pale segmental lines. Fore wings: base of costa and a broad sub-basal inbent line fuscous brown, enclosing a white shade on inner margin and an ochreous shade above it; also followed below cell by an ochreous and white shade; costa beyond to postmedial yellowish white, shaded with orange and crossed by a dark medial line; cell and space below it dull grey-brown, crossed by the darker medial line, which is inbent close to inner margin; this is medially white, expanding to submedian between medial and postmedial lines; a white streak on discocellular; postmedial dark brown, oblique from costa to vein 3, sharply angled towards discocellular, enclosing a small white shade, suffusing with the grey-brown shade around discocellular streak, then downturned, and out-angled below vein 2; this line is followed by a yellowish-white shade, becoming orange, but is interrupted between vein 2 and fold by a fuscous-grey streak to termen; a sub-terminal white streak from costa near apex to vein 3, inwardly shaded with dark brown, broadly on costa, and outwardly edged by a black line, not reaching apex; termen from apex to vein 2 orange; an inbent white streak at tornus; cilia grey, shaded with fuscous at base, cut by white streaks between veins. Hind wings white; a short grey-brown streak at cell and vein 2, and a small spot near inner

margin above angle; a broader and longer vertical streak across median, nearer end of cell; a subterminal similar streak from near apex to vein 3; termen from vein 2 to near apex metallic golden, preceded by a velvety-black space broken into five spots by metallic lilac shades.

Expanse 19–27 mm.

*Hab.* Turrialba, Poas.

*Ambia argyractalis*, sp. n.

♀. Palpi, head, collar, and thorax creamy white, the latter medially shaded with grey. Abdomen whitish, with broad transverse segmental grey shades, dorsally interrupted at base. Wings thickly irrorated with fuscous grey on a whitish ground; a fine outbent subbasal white line, suffusing with a white streak on submedian from base, and with a short white streak on inner margin to antemedial, which is also fine, whitish, edged with darker grey, outcurved from costa; a broad medial whitish shade on costa; discocellular line fine, edged with white; postmedial deeply outcurved to near termen, fuscous, terminating at vein 2; a postmedial curved whitish shade below vein 2, in a line with discocellular; termen whitish, with a subterminal greyish line; a fine terminal black line; cilia long, the basal half buff, crossed by two fuscous lines, the outer half silvery grey. Hind wings: base white; a tuft of long black scales below vein 2 medially; a fuscous subterminal line, inangled at vein 2, followed by a narrow white shade; outer margin sinuous; small quadrate velvety-black spots on either side of veins 2–4, separated by orange streaks and preceded by silvery scales. Underneath whitish, the veins and costal margins shaded with pale brown; the outer lines fuscous brown, distinct; the terminal lines on fore wings broken into minute spots.

Expanse 20 mm.

*Hab.* Juan Vinas.

Near *A. metalophota*, Hmps.

*Ambia intortalis*, sp. n.

♀. Body white, banded with brown-orange. Wings white, the markings yellowish brown. Fore wings: basal third of costa yellow-brown, extending into cell; inbent sub-basal and antemedial lines; a medial line, followed by a brown shade in cell, inbent on inner margin; a lunular line on discocellular, edged with fuscous, followed by yellowish streaks on veins; the costa postmedially yellowish; terminal

space yellow-brown; outer line white, edged with fuscous, inbent at vein 3 to discocellular, then yellow, downbent, and outwardly oblique; a subterminal broken white line, edged with fuscous. Hind wings: an antemedial line; a medial line, followed by a dark brown shade from below vein 2 to inner margin, above vein 2 yellow-brown, expanding, enclosing a small whitish shade beyond cell, and outwardly edged with fuscous, which is followed by an irregular white postmedial line; terminal space as on fore wings.

Expanse 16 mm.

*Hab.* Carillo.

*Ambia perornatalis*, sp. n.

♀. Head white; vertex behind brown. Thorax white, crossed by a brown line behind; patagia brown, spotted with white in front. Abdomen above brown, with white segmental lines at base. Wings yellow-brown, shaded with darker brown, the spots silvery white edged with fuscous; a small spot on costa near base; a large spot on inner margin from cell, inbent towards base, followed by a small spot between fold and submedian; a spot on costa just beyond middle, followed by a short streak below costa; a large medial spot on inner margin, its upper edge downbent along vein 2; a small elongated spot beyond cell; a large outer spot from costa, inwardly oblique to vein 4; a postmedial streak between veins 2 and 3; a large spot at tornus; a marginal spot from veins 4-6; a whitish streak at apex. Hind wings: a broad antemedial fascia; a small spot beyond cell; a large oblique postmedial spot from costa to vein 4, a minute spot below it, and elongated spot to inner margin near angle; marginal white spots, the largest at apex and between veins 2 and 3.

Expanse 17 mm.

*Hab.* San Gerónimo.

Near *A. leucoplaca*, Hmpsn.

*Nymphula fluvialis*, sp. n.

♀. Body white; some yellow-buff shading on shoulders, thorax behind, and segmentally at base of abdomen. Wings white; a fuscous line on costa at base; a subbasal similar line, becoming yellowish buff below cell; antemedial pale yellow shades on costa, in cell, below it, and on inner margin; a medial fuscous line, diverging below cell and forming a ring; a pale yellow spot at end of cell, its outer edge incurved; an indistinct sinuous, postmedial, fuscous line; a

broad and irregular subterminal yellow-buff shade; a similar terminal shade, expanding at vein 3. Hind wings: a geminate antemedial fuscous line, partly filled in with dark irrorations; a large yellow-buff spot at end of cell; a post-medial fuscous line, inangled on vein 6, then outcurvel, inbent at vein 4, and straight from 3 to just above angle on inner margin; an irregular subterminal and terminal yellow-buff shade.

Expanse 18 mm.

*Hab.* Sixola.

*Oligostigma mollitalis*, sp. n.

Body and wings white. Fore wings: a black spot at base of cell; a brown basal line on costa, followed by a large yellowish spot; an antemedial yellowish curved line; discocellular surrounded by a fuscous line, except behind, where the inner portion of line continues as a wavy yellowish medial line to inner margin, the outer portion expanding between veins 3 and 5, also yellowish, and is upbent to costa as a fine postmedial line; some yellowish streaks and dark irrorations beyond discocellular and above it: a subterminal yellowish shade, followed by a fine fuscous line from and incurved at apex; terminal orange streaks at apex. Hind wings: antemedial, postmedial, and subterminal lines, slightly curved, and shaded with brown on inner margin.

Expanse 13 mm.

*Hab.* Carillo, Sixola, Esperanza.

*Oligostigma profusalis*, sp. n.

♀. Palpi white, streaked above with olive-brown. Body dark olive-brown; white lines on frons near eyes; patagia edged with white; segmental white lines on abdomen. Wings olive-brown. Fore wings: two whitish lines at base inbent from costa; an outbent medial whitish fascia from costa to submedian fold, then sharply inbent along inner margin, edged by a geminate fuscous line filled in with clearer white; a similar postmedial space, wide on costa, its outer edge incurved below vein 6, so that it forms a narrow oblique projection to just below vein 2; a subterminal white line, edged with black, its inner margin incurved below vein 4, making it broader; termen narrowly bright yellow; cilia silvery grey, crossed by a fuscous line at base. Hind wings: base narrowly white; a broad white medial fascia, crossed by fuscous lines near its margins; outer space



yellowish brown; a subterminal white line edged with fuscous from below vein 4 to near anal angle; outer margin indented above vein 3 and above vein 5; a terminal velvety-black line from just below vein 4 to near apex, cut by yellow veins, and partly with small white spots on interspaces; termen bright yellow beyond the subterminal white line.

Expanse 29 mm.

*Hab.* Guapiles.

Near *O. cryptalis*, Dr.

*Aulacodes delicata*, sp. n.

♂. Head, collar, and thorax dark olive-brown; a few fine white scales on vertex and collar, thorax laterally whitish. Abdomen bistre, shaded with white at base. Fore wings olive-brown, the lines white; a fine antemedial line, nearly vertical, inbent on inner margin; a fine medial line, outwardly oblique; postmedial outbent, thicker, indistinctly suffusing with the similar outer line, which is inbent; subterminal broad, slightly inbent above tornus, suffusing at apex with terminal line, which is broad to vein 5, only faintly indicated below it. Hind wings dark grey-brown, with faint indications of a pale medial and subterminal line.

Expanse 15 mm.

*Hab.* Carillo, Esperanza.

*Parthenodes incultalis*, sp. n.

♂. Palpi, head, collar, and thorax whitish, irrorated with bistre-grey. Abdomen white, dorsally shaded with pale buff, the base irrorated with grey. Fore wings semihyaline greyish white; the base broadly and margins opaque white, shaded with bistre and irrorated with dark grey, the irrorations less apparent on costa; faint bistre shadings in cell; discocellular streak bistre, inwardly edged with some black irrorations; some faint bistre shadings before terminal white space. Hind wings white, irrorated with dark grey, forming a more distinct medial shade, postmedial space somewhat hyaline, tinged with bistre and crossed by dark irrorations.

Expanse 17 mm.

*Hab.* Carillo.

*Clupeosoma lavinia*, sp. n.

♀. Palpi orange-brown. Head, collar, and thorax brownish grey; some white on vertex. Abdomen dorsally brownish buff, laterally white. Fore wings: the base nar-

rowly and margins clear dark brownish grey, the discal space semihyaline whitish, crossed by orange-brown veins and broken into spots by dark brown lines; a large antemedial spot from subcostal to near inner margin, preceded by a small spot below cell; a large medial spot in cell and one below, cut by an orange-brown shade on fold; discocellular broadly brownish grey, suffusing with costa and expanding behind along median; a fine inbent postmedial line, out-curved from costa to vein 6, again to vein 3, then sinuous to submedian; the terminal dark space widest between veins 5 and 6 and from vein 3 to inner margin; a terminal black line; margin incurved below apex and below vein 3; cilia buff in curves, otherwise fuscous. Hind wings opalescent white, the termen narrow brown-grey. Hind wings below with a fine broken postmedial line and terminal fuscous points; a medial brown spot on costa.

Expanse 20 mm.

*Hab.* Juan Vinas.

*Pileocera inconspicua*, sp. n.

♀. Body and wings grey-brown; some white shading on vertex; segmental white lines on abdomen. Fore wings: a subbasal fuscous line and antemedial point in cell; an oblique streak on discocellular and medial line below it to inner margin, its upper end faintly downbent on vein 2; outer line thick on costa and slightly incurved and oblique to tornus, outwardly pale shaded; the costa at apex shaded with buff; a broad terminal fuscous line intersected by veins. Hind wings: a medial line; an outer line from costa to vein 2 at termen, which it follows to anal angle. Wings below white, the fore wing shaded with fuscous; the lines very distinct; the medial lines on hind wings from discal spot to inner margin.

Expanse 16 mm.

*Hab.* Sixola.

*Stenia carillalis*, sp. n.

♂. Palpi fuscous brown, fringed below with white. Frons dark grey. Vertex, collar, thorax, and base of abdomen white, the shoulders shaded with brown, the abdomen terminally with dark grey. Fore wings dirty white, lines fuscous brown, also costa to beyond middle; a curved subbasal line; an antemedial linear quadrate spot in cell; reniform large, linear; a medial line on inner margin, downbent above vein 2 to outer line, which is rather heavier, straight

from costa to vein 5, then slightly outcurved; a terminal dark shade from apex to vein 4, and small spots below it. Hind wings white; a medial line, slightly interrupted below cell, the inner portion of line downbent above vein 2; outer line irregular from costa to termen at vein 2; a slight dark shade at apex and terminal points.

Expanse 18 mm.

*Hab.* Carillo.

*Stenia pacificalis*, sp. n.

♂. Palpi dark brown, fringed below with white. Frons dark grey, vertex white; collar and thorax grey-buff, the collar outwardly and shoulders brown. Abdomen above whitish at base, otherwise dark brown crossed by whitish segmental lines. Wings whitish, thickly irrorated with grey-brown. Fore wings: costa darker shaded, the markings fuscous; a curved subbasal line; an antemedial point in cell and one below it; a streak on discocellular and wavy medial line from cell to inner margin; a slightly irregular vertical outer line; small terminal spots. Hind wings: base of inner margin clearer; a wavy medial line; a wavy outer line to termen at vein 2. Hind wings below with medial line absent on costa and just below cell,

Expanse 22 mm.

*Hab.* Poas.

♀. Hind wings white, with lines as in male; otherwise very much like *S. poasalis*, Schs.; also near *S. datisalis*, Dr.

*Stenia poasalis*, sp. n.

♂. Palpi black. Head buff. Collar grey, outwardly shaded with fuscous. Thorax and abdomen grey, irrorated with grey-brown, the abdomen dorsally shaded with fuscous. Fore wings whitish, thickly irrorated with grey-brown, the lines fine, darker; an antemedial dark point in cell and faint streak on discocellular; an outer line, vertical, to inner margin near tornus; cilia buff-grey, crossed by a darker line. Hind wings white; costal margin narrowly grey-brown; a wavy postmedial line from costa to vein 2, then upbent to near cell and downturned to inner margin; a dark terminal line; cilia whitish, crossed by a dark line. Hind wings below similar, but with a small dark spot on discocellular anteriorly.

Expanse 27 mm.

*Hab.* Poas.

LXXIV.—*On a new Genus of Cyprinoid Fishes from High Asia.* By Dr. ERICH ZUGMAYER, München.

Among the fishes collected by Professor Dr. G. Merzbacher in the Thian-Shan range during 1907 and 1908 there is a number of Cyprinoids hitherto undescribed and deserving generic rank.

*Aspiopsis merzbacheri*, gen. et sp. n.

D.  $\frac{3}{8}$ , P.  $\frac{1}{16}$ , V.  $\frac{1}{9}$ , A.  $\frac{3}{9}$ , C.  $\frac{17}{15}$ , ll. 71  $\frac{14}{7}$  73.

Body elongate and slightly compressed, its depth being contained  $5\frac{1}{2}$  times in the total length (including the caudal). Length of head  $4\frac{1}{7}$  in total length; caudal peduncle twice as long as high, its length being the same as that of the pectoral. Fins short, origin of dorsal very slightly behind that of ventrals, anal entirely behind dorsal. Mouth terminal, its cleft oblique; maxillary reaches to below front margin of eye, dental to below centre. Upper jaw protractile by  $\frac{2}{3}$  of diameter of orbit. Lower jaw without symphysial knob or corresponding notch. Abdomen rounded; lateral line complete, slightly irregular in fore part, terminating in middle of caudal peduncle. Pharyngeal teeth in two series, 3—5—5—3, compressed and notched.

Colour bronzy on back, sides of head and body yellowish silvery, very finely scattered dark dots along the sides.

Length not exceeding 10 inches.

Sixteen specimens were caught in Manass River, west of Urumteli, on the north slopes of the Thian-Shan range, where the river enters into the plain.

LXXV.—*Description of a new Characid Fish from the Amazon.* By C. TATE REGAN, M.A.

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*Iguanodectes rachovii*, sp. n.

Depth of body nearly equal to length of head, about  $4\frac{1}{2}$  in the length. Snout a little shorter than diameter of eye, which is equal to the length of postorbital part of head or to interorbital width. Jaws equal anteriorly; maxillary small,



not extending to below the eye; teeth in jaws uniserial, multicuspid incisors; premaxillaries with an anterior external pair of unicuspid teeth. Dorsal 10-11; origin nearer to base of caudal than to end of snout. Anal 33-34; origin below middle of dorsal. Pectoral shorter than head. Caudal forked. About 60 scales in a lateral longitudinal series, 9 from dorsal fin to lateral line, 5 or 6 from lateral line to pelvis. Olivaceous above, silvery below, with a plumbeous lateral band ending in a blackish spot on the middle caudal rays.

Four specimens, 47 to 60 mm. in total length, from the Amazon at Manãs, presented to the British Museum by Herr A. Rachow.

The genus *Iguanodectes*, Cope, established for *I. tenuis* from the Ambyacu River, is related to *Piabua*, differing in that the thorax and abdomen are not compressed to an edge, just as *Brycon* differs from *Chalcinus*.

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LXXVI.—*List of a Third Collection of Mammals from Panyam, N. Nigeria, presented by the Rev. G. T. Fox.*  
By OLDFIELD THOMAS.

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THE British Museum has received from the Rev. G. T. Fox a third collection of mammals from the interesting locality in N. Nigeria where the two previous collections described in the 'Annals' were obtained. But I regret to announce that this will be the last that we shall owe to Mr. Fox, as he died of fever early in this year, losing his life in the missionary cause that he had so much at heart. As a collector he was keen and enthusiastic, and we hoped to have many more valuable contributions from him.

The present series contains several species additional to the previous lists, and notably a good set of a new *Dasymys*, which lives in the streams like the British water-vole, and which I have named after Mr. Fox as a final tribute to his memory.

All the specimens are from Panyam, on the plateau of the same name; elevation 4000'.

1. *Crocidura* sp. (near *oricoides*, Murray).

♂. 151.

2. *Erinaceus* sp.

♀ . 91 (skull broken).

3. *Mungos (Ichneumia) albicauda*, G. Cuv.

♂ . 155. Panyam.

A very fine specimen ; tail black.

In the absence of good specimens representing the true Senegal *albicauda*, *nigricauda*, Pucheran, and *loempo*, Temminck, I do not now attempt to determine the exact race to which the Panyam "white-tailed" mongoose belongs.

4. *Euxerus erythropus*, Geoff.

♂ . 157 (immature).

5. *Graphiurus* (? *lorraineus*, Dollm.).

♀ . 142.

Not fully adult, and therefore not determinable with certainty.

6. *Tatera kempî*, Wrought.

♂ . 131, 147, 153 ; ♀ . 84, 128, 152.

7. *Taterillus nigeriæ*, Thos.

♀ . 129, 137.

8. *Dendromus nigrifrons*, True.

♀ . 83, 99.

9. *Steatomys caurinus*, Thos.

♂ . 132, 135, 143 ; ♀ . 133.

"Hibernating—very fat."—G. T. F.

10. *Epimys daltoni*, Thos.

♂ . 140, 154 ; ♀ . 85.

11. *Epimys* sp. (multimammate).

♀ . 125.

12. *Cricetomys gambianus olivæ*, Dollm.

♀ . 156.

The typical specimens were obtained in Bornu.

13. *Arvicanthis mordax*, Thos.

♂. 94, 120, 121, 126, 130, 149; ♀. 98, 134, 138, 141.

14. *Arvicanthis barbarus nigerica*, Thos.

♂. 92, 122, 139.

15. *Uranomys foxi*, Thos.

♂. 124.

A second specimen of this rare species is a welcome accession.

16. *Dasymys foxi*, sp. n.

♂. 93, 97, 136, 145; ♀. 95, 96, 127, 144.

Allied to the Uganda *D. medius*; larger, and with larger teeth than the Liberian *D. rufulus*.

Size about as in *D. medius*, or a little larger. Fur loose and coarse. General colour of about the same warm brown as in *medius*, though the mixture is coarser, owing to the buffy subterminal rings on the hairs being longer. Sides and under surface washed with dull clay-colour or pale buffy. Muzzle, ears, feet, and tail dark smoky brown.

Skull a little longer than that of *medius*; muzzle more parallel-sided; interorbital region broader; brain-case a longer oval, its ridges less strongly developed. Concavity of anteorbital plate well marked. Palatal foramina long and narrow. Bullae averaging rather smaller than in *medius*, though both species vary in this respect. Molars larger and heavier, broader in proportion to the space between them.

Dimensions of the type (measured in the flesh):—

Head and body 144 mm.; tail 151; hind foot 33; ear 23.

Skull: greatest length 37·5; condylo-incisive length 37·8; zygomatic breadth 19; nasals 15; interorbital breadth 4·6; palatilar length 20; diastema 12·1; palatal foramina 8·8; upper molar series 7·7; breadth of palate between  $m^1$  2·0.

*Type.* Adult female. B.M. no. 12.4.3.15. Original number 95. Collected 27th December, 1911.

“Water-rat; found on river-banks; a great swimmer.”—*G. T. F.*

The species of the genus *Dasymys* are not very sharply defined, but I cannot identify Mr. Fox's one with any previously described. The teeth are materially larger than in the only known W.-African form, *D. rufulus*, Miller, and its nearest ally would seem rather to be *D. medius* of Central Africa, with which it is compared in the description above.

Mr. Fox's observation that this animal is a water-rat is of

interest, as there are remarkably few distinctively water animals among the small rodents of Africa, and the other members of the genus are said to be inhabitants of deep grass and swampy ground.

17. *Georychus foxi*, Thos.

♂. 78, 82.

18. *Lepus* sp. (perhaps *L. zechi*, Matsch.).

♂. 150. Panyam.

LXXVII.—*New Species of Crocidura and Petaurista from Yunnan.* By OLDFIELD THOMAS.

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*Crocidura dracula*, sp. n.

A large blue-grey species, with a long slender tail.

General characters very much as in *C. attenuata*, M.-Edw., but size larger. Colour above uniform dark bluish grey (about grey no. 4); underside "smoke-grey," or rather more drab. Hands and feet dull whitish. Tail long, slender, not incrassated, grey-brown above, whiter below and at the extreme tip; long caudal bristles present, but not specially numerous.

Skull as in *C. attenuata*, but larger.

Dimensions of the type (measured on the skin):—

Head and body 92 mm. (collector's flesh-measurement 85); tail 69; hind foot 17.

Skull: condylo-basal length 22.4; condylo-incisive length 24; greatest breadth 10.2; upper tooth-series 10.5; breadth across molars 7.1.

*Hab.* Yunnan (probably near Mong-tze).

*Type.* Adult male. Original number 34. Collected 30th April, 1910, by Orii. Four specimens examined.

This shrew is most closely allied to the Chinese *C. attenuata*, M.-Edw., but differs by its larger size. I owe to Prof. Trouessart, of the Paris Museum, some detailed measurements of the Paris specimens of *C. attenuata*, which have helped me in making this comparison.

No *Crocidura* of this type has been described from India, where nearly all the white-toothed shrews are members of *Pachyura*.



*Petaurista marica*, sp. n.

A white-spotted species near *P. punctatus*\*.

Size, judging by skull, about as in *P. punctatus*. Fur very soft and fine. General colour above, apart from the white spots, approaching "tawny olive," becoming more tawny posteriorly and on the patagium, the hairs subterminally ringed with buffy or ochraceous; anteriorly the colour darkens to blackish, the ends of the hairs on the crown glossy black. Upper surface of head and body with a variable number of pure white spots, each about  $\frac{1}{4}$ – $\frac{1}{2}$  inch in diameter, the least spotted of the three specimens having about thirty spots and the most spotted perhaps double that number, with the head particularly profusely spotted; in none, however, are the spots so numerous and widely spread as in the type of *P. punctatus*. Patagium tawny above, brilliant ochraceous rufous below. Under surface bright ochraceous buff; a dark brown spot on the chin. Hands irregularly marked with dark brown and deep tawny; outer sides of legs and upper side of feet rich ochraceous rufous; the digits in one specimen partly brown. Tail ochraceous rufous, some of the hairs subterminally ringed with blackish and buffy; tip more or less washed with blackish.

Skull like that of the type of *P. punctatus*, but there is a striking amount of variation in its general outline, especially in that of the muzzle, this being long and narrow in No. 3, short and broad in No. 2.

Dimensions of the type (measured in the flesh by the Japanese collector):—

Head and body 365 mm.; tail 380; hind foot 63; ear 44.

Skull: greatest length 63; condylo-incisive length 59; greatest breadth 42; nasals  $19.7 \times 11.4$ ; palatilar length 29.5; palatal foramina 4.7; upper tooth-series exclusive of  $p^3$  12.6.

*Hab.* Yunnan (probably near Mong-tze).

*Type.* Adult male. Original number 1. Collected 29th January, 1910, by Orii.

This beautiful flying-squirrel is most closely related to *P. punctatus*, but differs by its more yellowish general colour, its blackish head, and bright rufous tail and feet. The fact that all three specimens are spotted shows that this character in *P. punctatus* is a normal one, and not a mere individual aberration, as has been sometimes supposed.

\* *Petaurista* is masculine, so that the masculine form of adjectival names must be used for the species. But if the names are substantives in apposition the more euphonious feminine form is permissible.

In their skulls both *P. punctatus* and *P. marica* approach the border-line of the genus towards the large species of *Sciuropterus* (subgenus *Hyllopetes*), which are not very readily separable from them. Perhaps the best character to distinguish the two genera is the presence in *Petaurista* of a deep slanting notch at the postero-internal angle of the upper teeth, this being absent in *Sciuropterus*. But even this character is less developed in the present annectant species than in the other members of *Petaurista*.

### BIBLIOGRAPHICAL NOTICES.

*Oxford Gardens.* By R. T. GÜNTHER, M.A., Fellow of Magdalen College. 8vo. Pp. xv, 280. Illustrated. Parker, Oxford. 1912. Price 6s. net.

THIS delightful little book is based upon Dr. Daubeny's popular guide to the Physick Garden of Oxford, the reissue of which in a revised and enlarged form "is due to the fact that neither the guides written by Dr. Daubeny nor the Garden itself are as well known in Oxford as they ought to be." The Oxford Botanic Garden is the oldest in Great Britain, having been founded through the generosity of Lord Danby in 1621, nearly sixty years before the old Physick Garden at Chelsea. Robert Morison, the first professor, was not appointed until 1669, but from 1632 Jacob Bobart, the elder, was in charge of this garden, and in 1648 published the first catalogue of plants. His son, also Jacob Bobart, succeeded Morison as professor on the death of the latter in 1683. Later, the munificence of William Sherard secured the nomination of the celebrated Dillenius (1734-1747); other famous botanists who have occupied the Chair were John Sibthorp (1784-1795), best known by his work on the flora of Greece, and Dr. Daubeny (1834-1867), who, finding the garden in a most unsatisfactory state, lived to see it "entirely rearranged, enriched with extensive houses, extended in area, and made both attractive and beautiful." All this and much more of historical interest the reader will find in Mr. Günther's Introduction, which is followed by an account of the Contents of the Garden, not in the form of a mere catalogue, but in a series of chapters in which former arrangements are referred to, while numerous observations, anecdotal and otherwise, are inserted. Mr. Günther refers to his work as a labour of love, and modestly suggests that he is merely an amateur. We suspect, therefore, that he does not fully realize the significance of his remark on American nomenclature when he says, apropos of the Californian Big-tree (*Sequoia gigantea*): "An American botanist has renamed this genus *Washingtonia*: there is no end to the confusion introduced

into scientific nomenclature by the ignorance or jealousy of 'scientists' over the water"!

The account of the plants is supplemented by a series of "faunistic notes"; following these is a chapter on the Herbarium, one of the richest in pre-Linnean collections, and including the herbaria of Morison, Du Bois, and Sherard, as well as those of Dillenius and Sibthorp.

The Fielding Herbarium of over 89,000 specimens was acquired in 1852. The Museum, Library, Lecture- and Work-rooms, Professor's house (where the Professor does *not* reside), and Experimental Garden are described, and there is also an interesting Bibliography. An Appendix is devoted to the College Gardens and others to the "Parks" and "Other Noteworthy Trees."

Enough has been said to indicate the value of this little book, not only to the student, but to any who are interested in Oxford and its gardens; and its value is enhanced by the beautiful photographic plates with which it is profusely illustrated. A. B. R.

*Catalogue of the Lepidoptera Phalaenæ in the British Museum.*

Vol. XI. *Catalogue of the Noctuidæ.* By Sir GEORGE F. HAMPTON, Bart. London: Printed by Order of the Trustees, 1912. Pp. xvii, 689; price 20s. Pls. clxxiv.-cxci.; price 17s. 6d.

VOLUME XI. of this monumental work is the eighth devoted to the Noctuidæ, and includes four subfamilies—Eutelianæ, Stictopteriniæ, Sarrothripinæ, and Acontianæ. It is somewhat thinner than Vol. X., which appeared in 1910. Only eight of the fifteen subfamilies into which the Author divides the Noctuidæ have yet been discussed, and Vol. XI. extends to no. 7127. As some of the largest subfamilies have still to come, we doubt if the middle of the Noctuidæ has yet been reached. It is already evident that the Catalogue of Moths is likely far to exceed the dimensions of Dr. Bowdler Sharpe's great Catalogue of Birds.

The moths described in Vol. XI. are mainly tropical or sub-tropical, though a few are well-known European and even British species, such as the very variable *Sarrothripus verayana*, described, with a formidable array of synonyms, on pp. 265, 266. The moth itself is very widely distributed, the Museum containing specimens from Britain to Japan, from Scandinavia to Algeria and Madras, and from Canada to California and Arizona.

In all points of importance Vol. XI. differs little from the previous volumes which we have had the pleasure of reviewing from time to time. Besides the coloured plates, several very interesting species are represented in the 275 illustrations in the text, one of the most remarkable being *Cossedia evaeinalis*, Walk., from Borneo, figured on p. 481. f. 179. It goes without saying that a large number of new genera and species are characterized in Vol. XI. in addition to those previously described.

*Memoirs of the National Museum, Melbourne.* No. 4. Published by Order of the Trustees. Melbourne, February 1912. Pp. 57. pls. viii.

THIS contains an extremely interesting and varied series of papers, dealing with Mollusca (Land-Shells and a fossil *Pecten*), Insects (Lepidoptera, Coleoptera, and Cicadidae), and Fijian clubs ornamented with Maori patterns, &c. The article on Lepidoptera is of special importance, furnishing us with identifications of most of the Australian Lepidoptera described by Walker in his 'Characters of undescribed Lepidoptera Heterocera.' The "Index to the Land-Shells of Victoria" and the "Catalogue of Victorian Cicadidae in the National Museum, Melbourne," followed by descriptions of new species, and the "Notes on a Collection of Tertiary Limestones and their Fossil Contents from King Island," are also valuable papers; and we have pleasure in calling attention to the activity displayed by the Melbourne Museum in the publication before us. W. F. K.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

March 13th, 1912.—Dr. Aubrey Strahan, F.R.S., President,  
in the Chair.

The following communication was read:—

'Some New Lower Carboniferous Gasteropoda.'  
By Mrs. Jane Longstaff (*née* Donald), F.L.S.

Eight species of gasteropoda are described, six being regarded as belonging to five new genera or subgenera, the others representing *Pithoeca*, De Koninck, which has not previously been recorded from the British or Irish Carboniferous Limestone. Among others, the shell of *Pleurotomaria* (*Tropidostropha*) *griffithi*, McCoy, is described in detail, and the nature of the fine pitting of its external surface is discussed.



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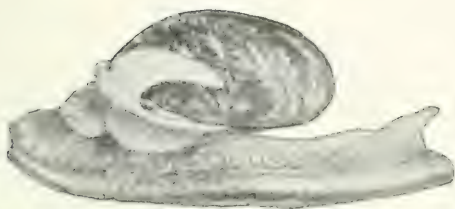
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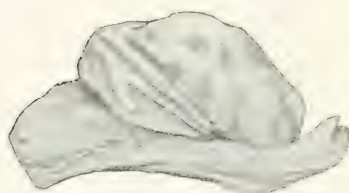
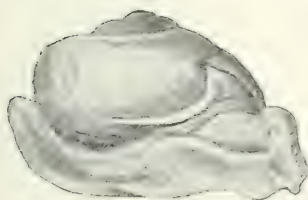
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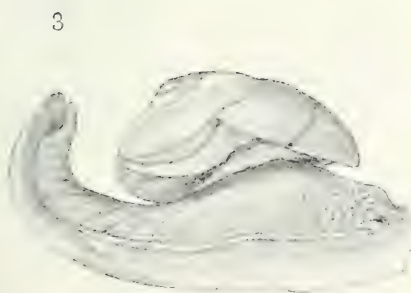
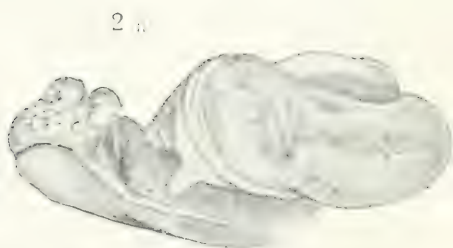
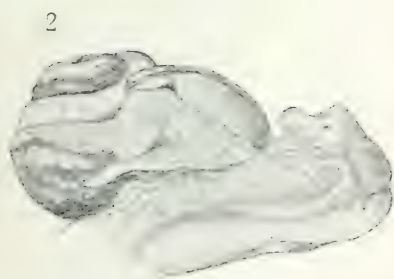
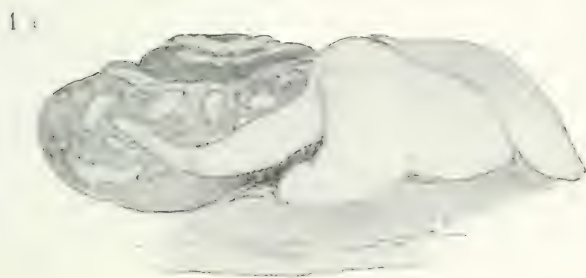
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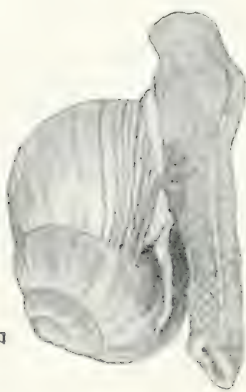
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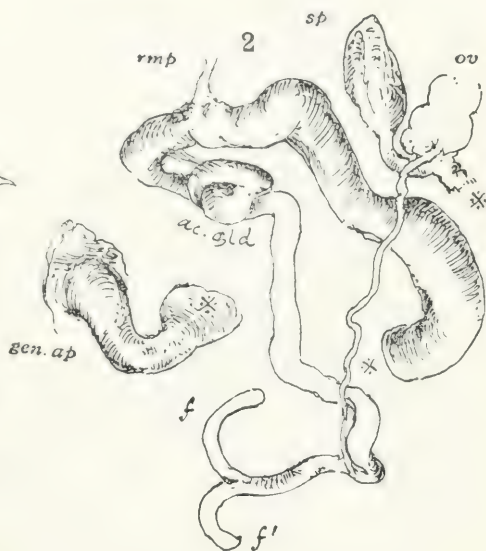
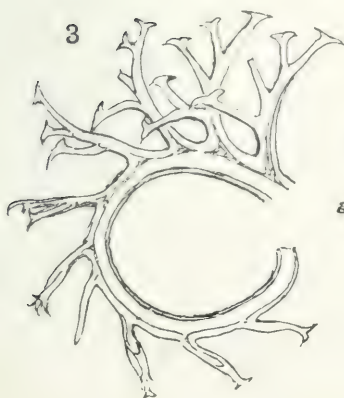
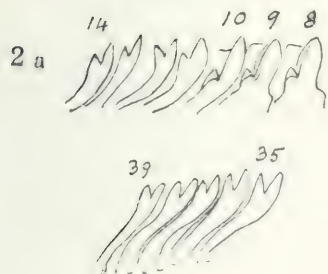
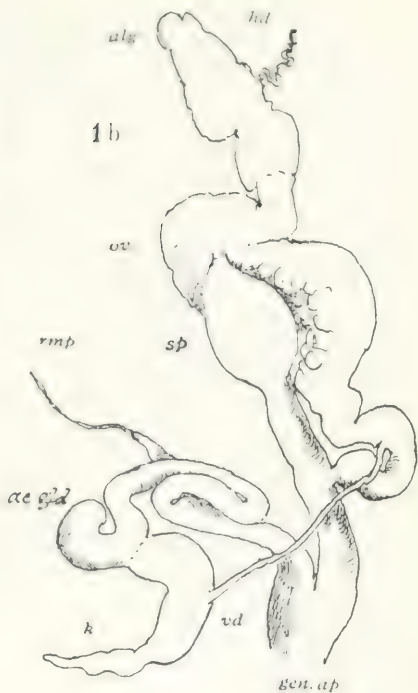
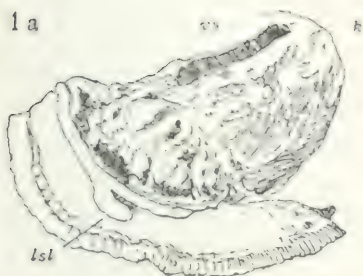


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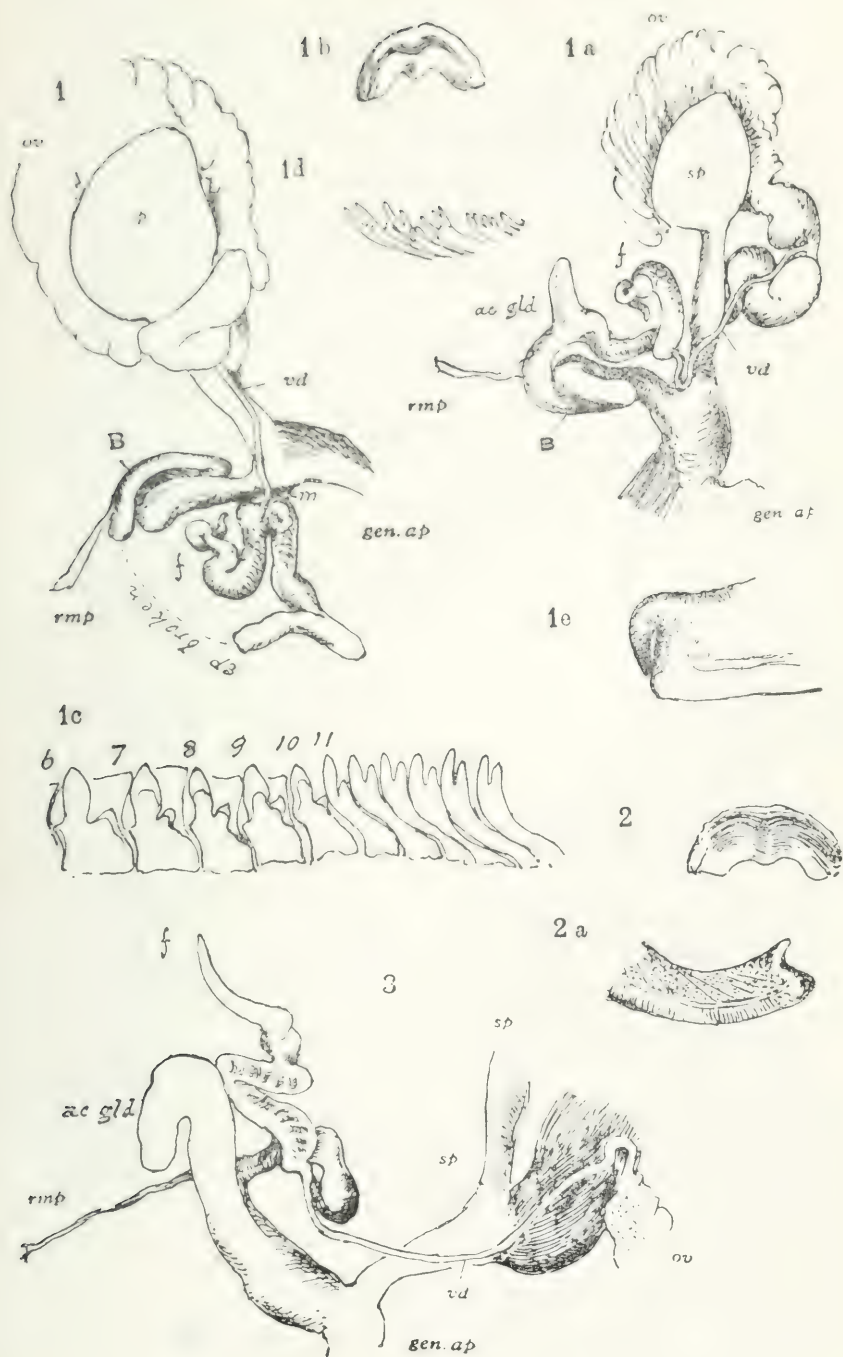






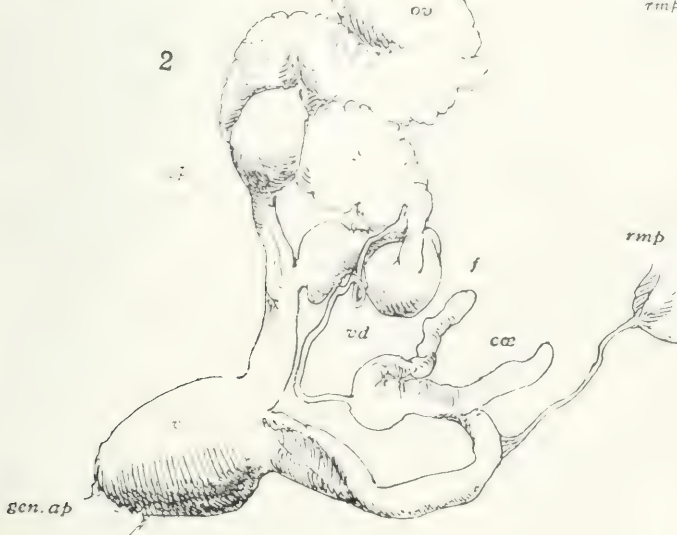
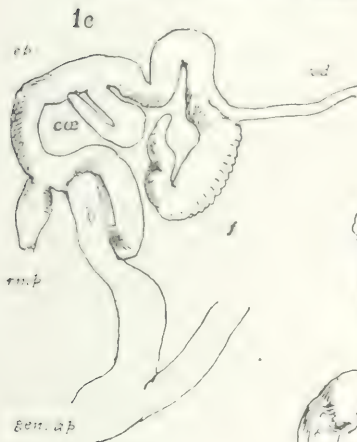
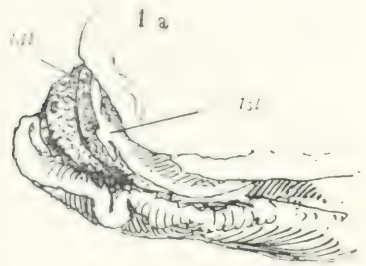




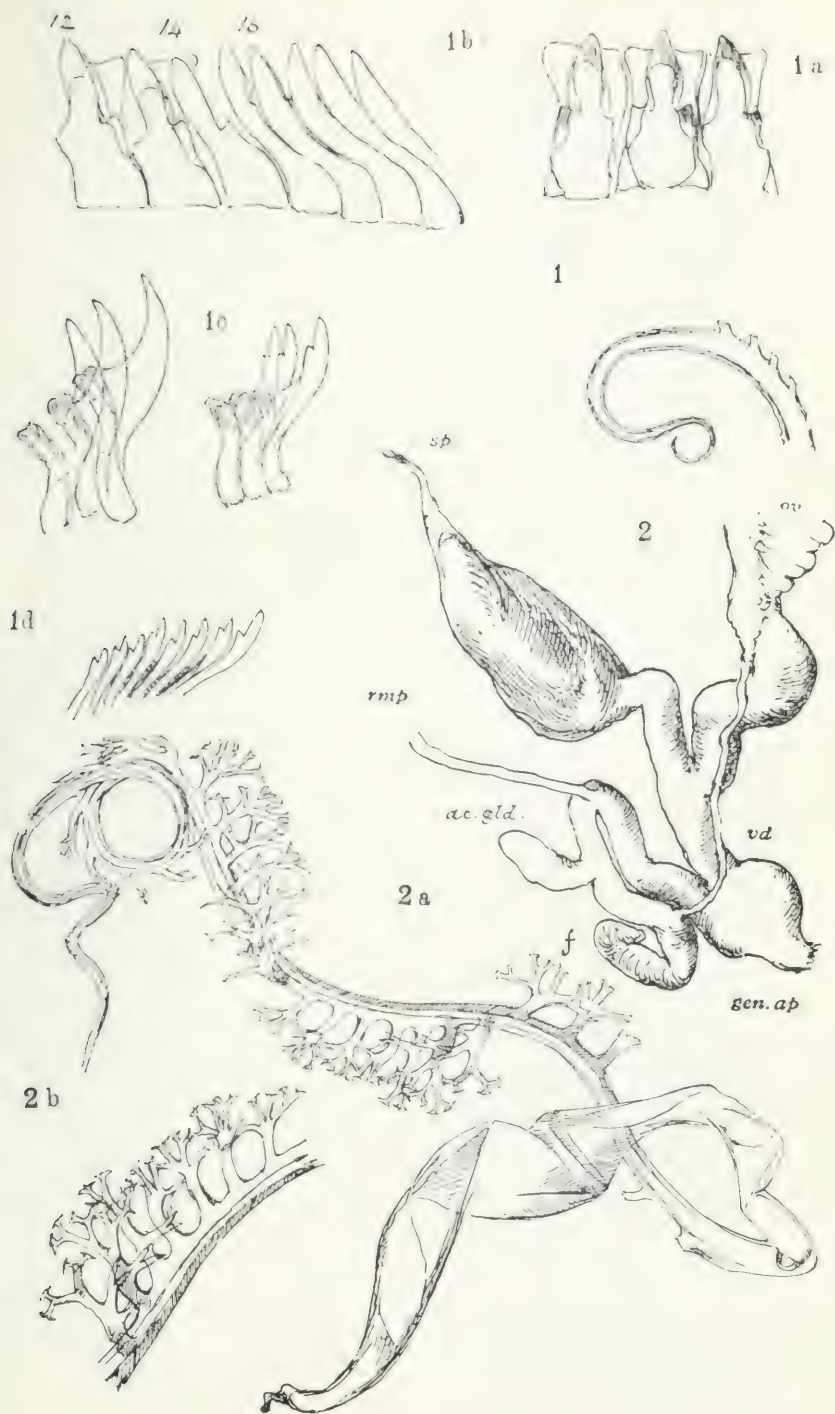
















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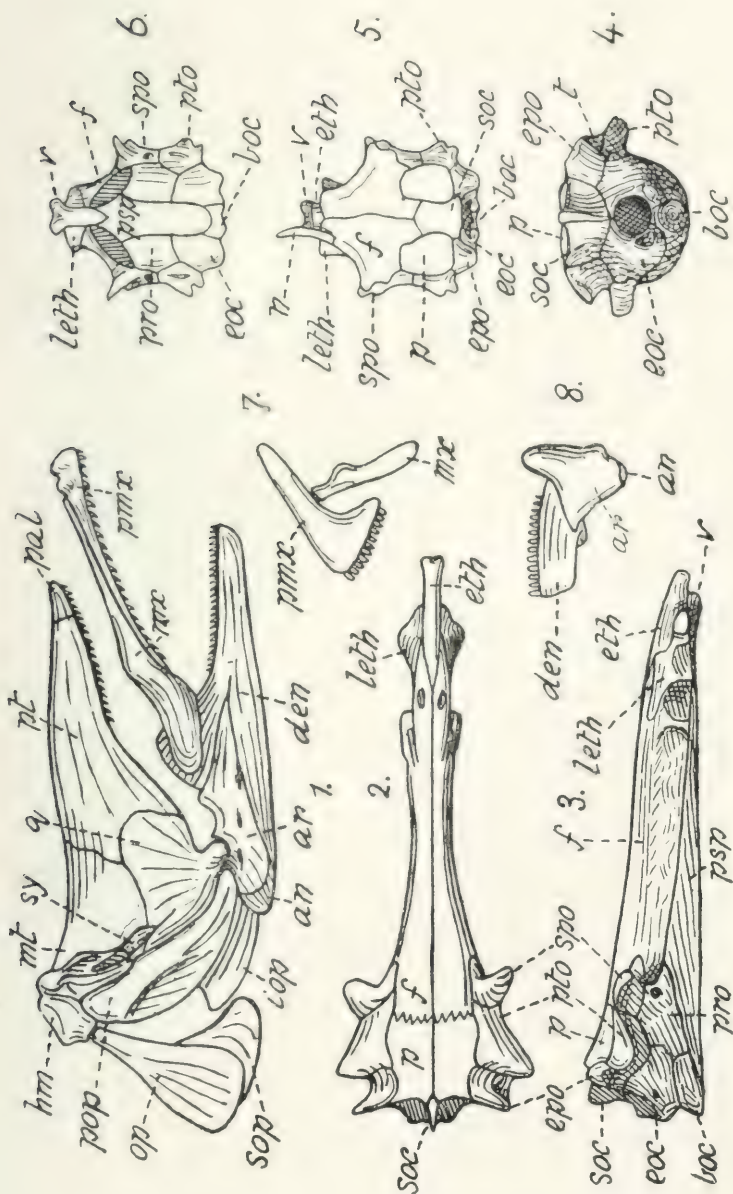
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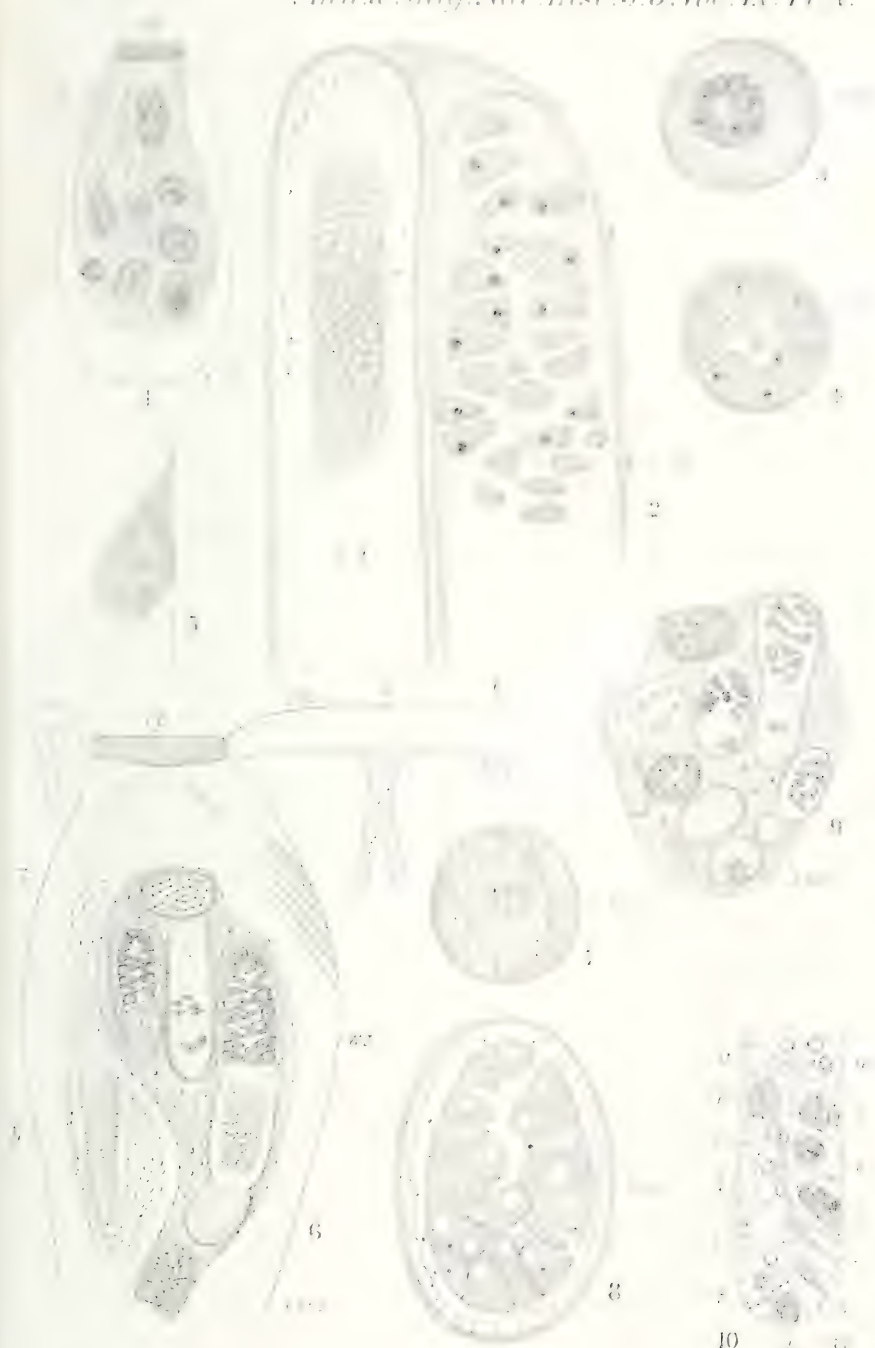




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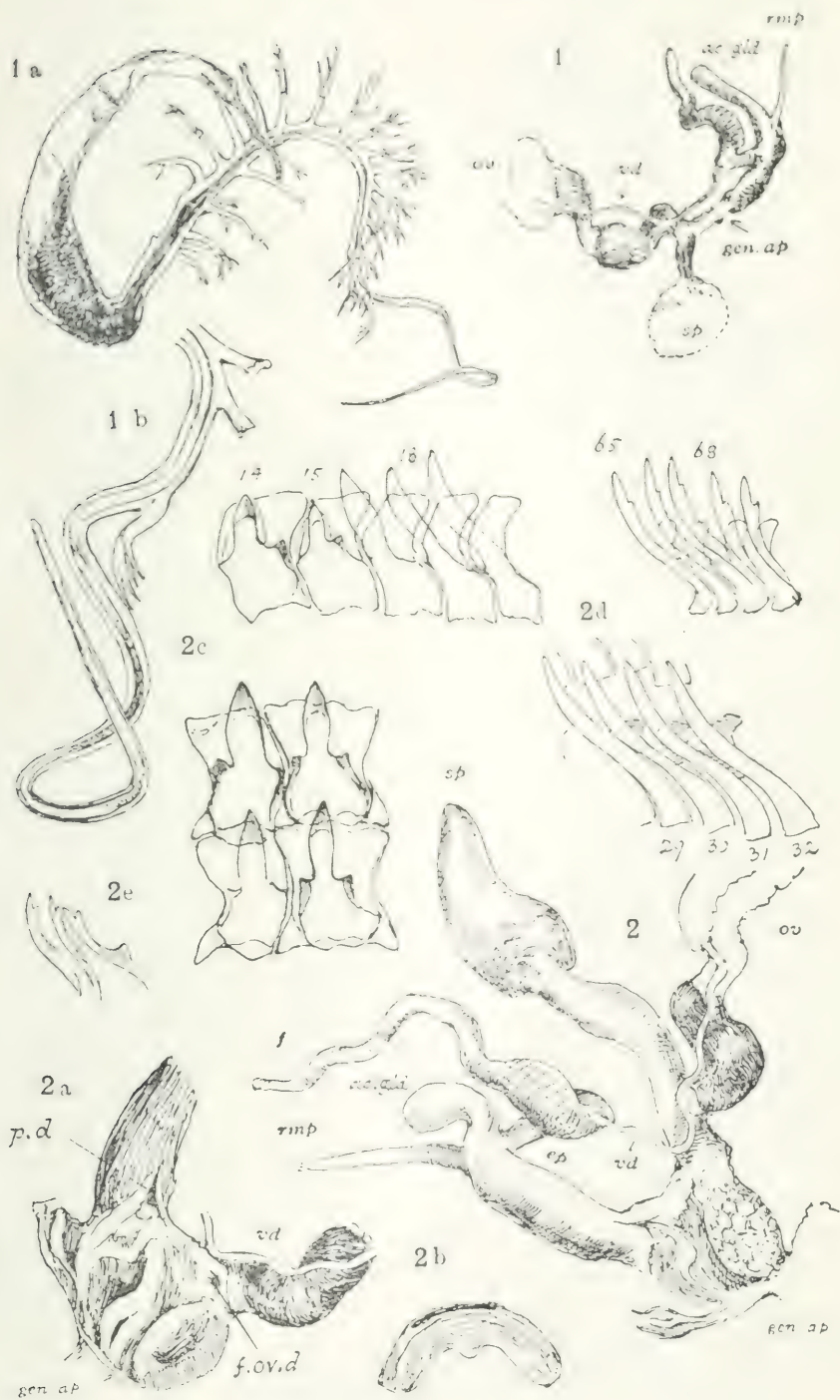




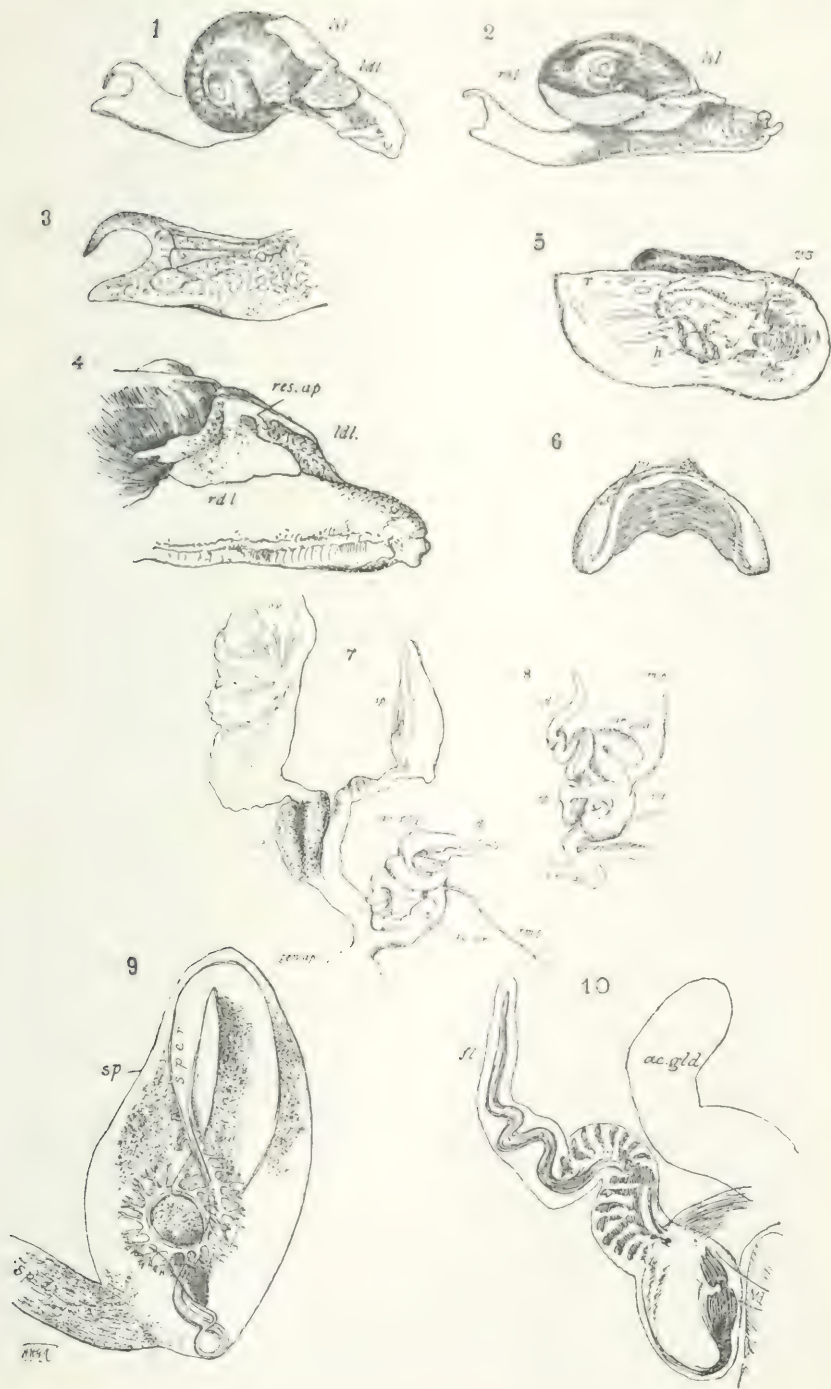






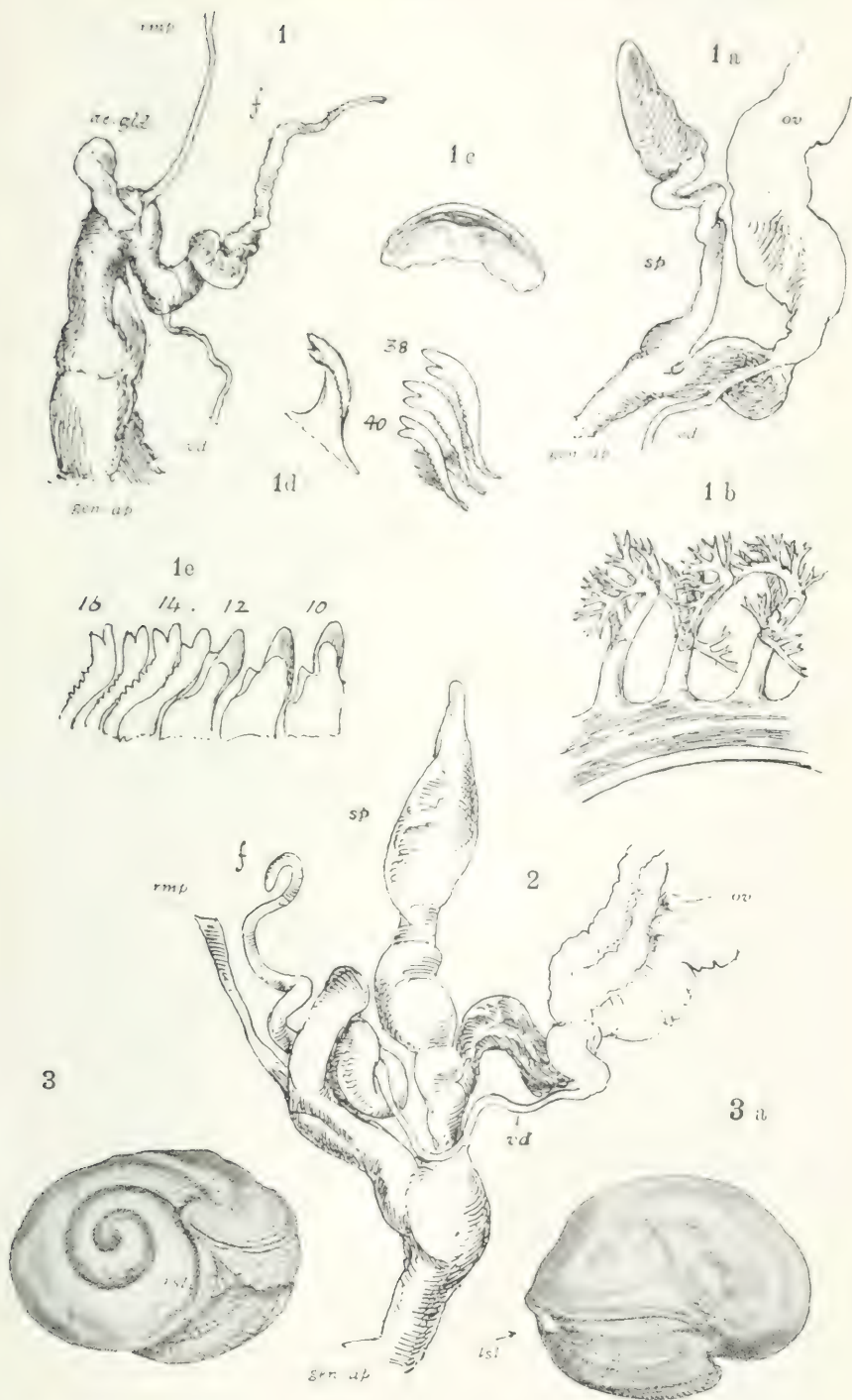




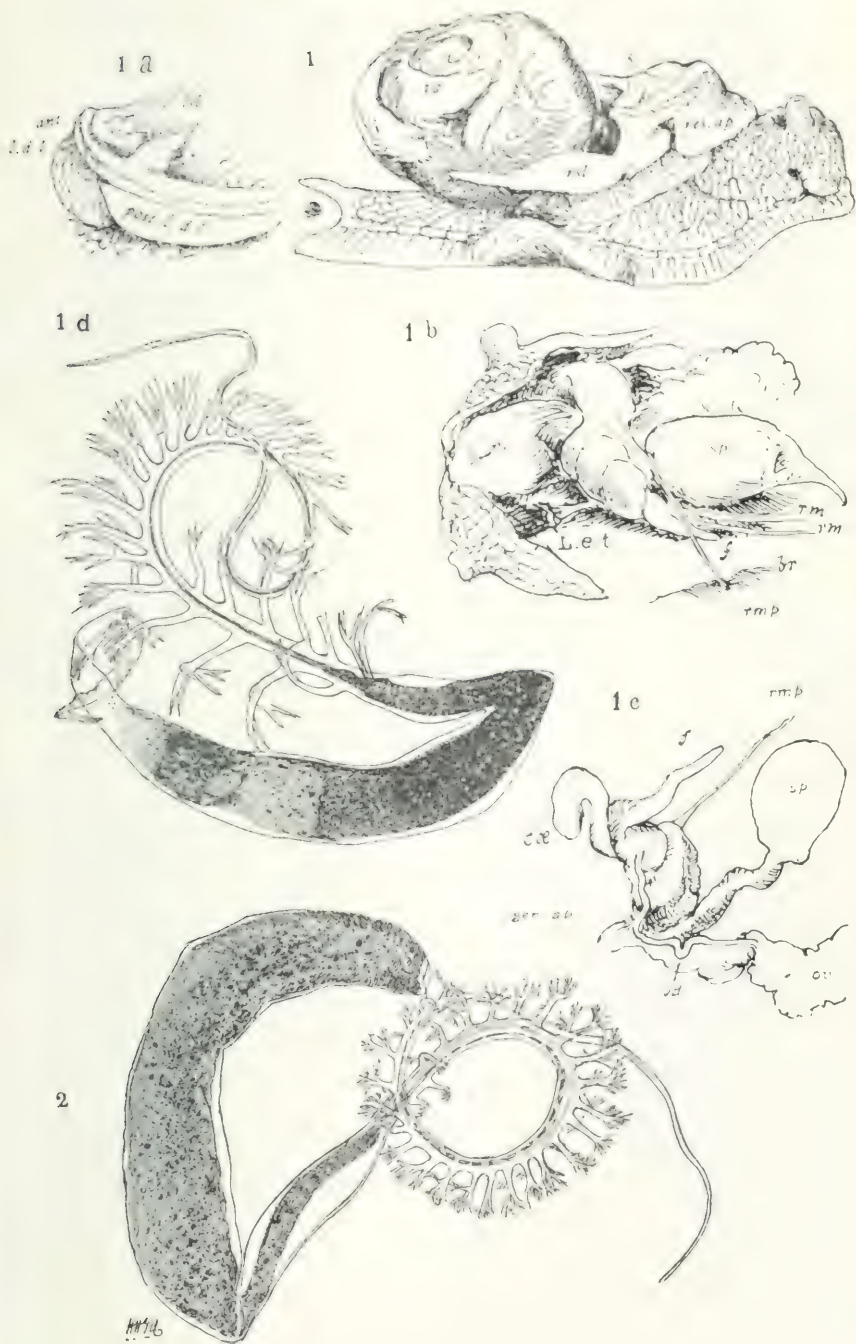






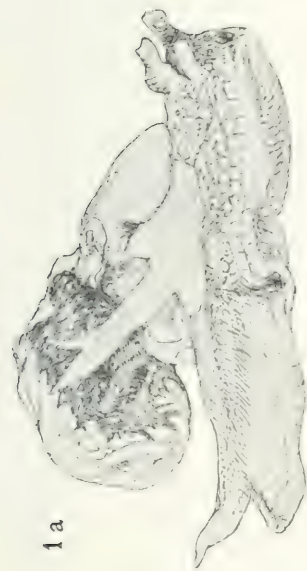












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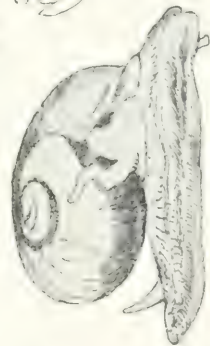
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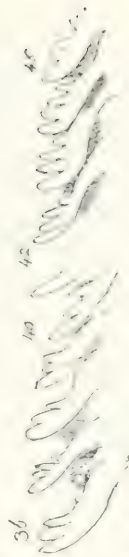
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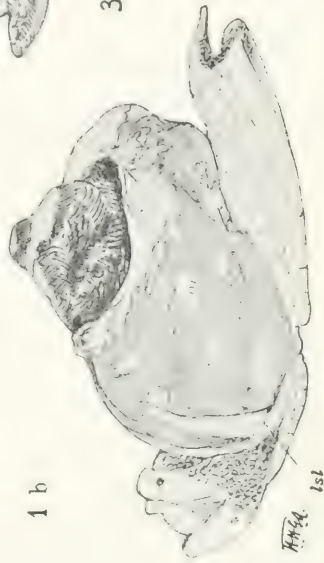
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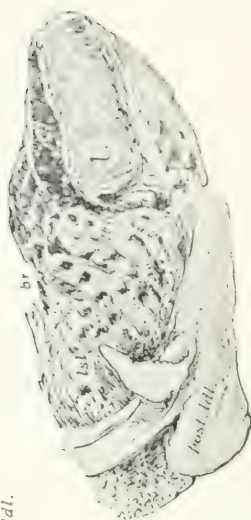










FIG. 1.



FIG. 2.

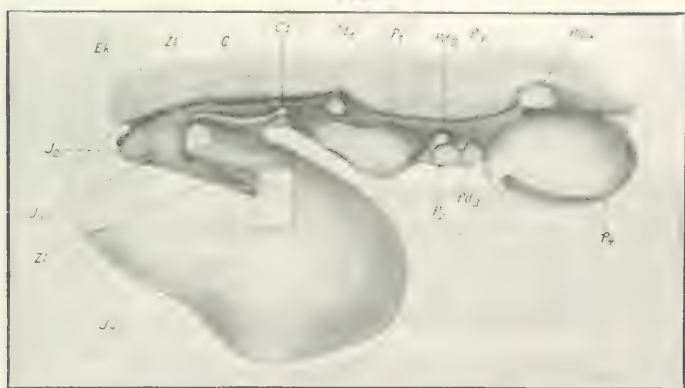


FIG. 3.

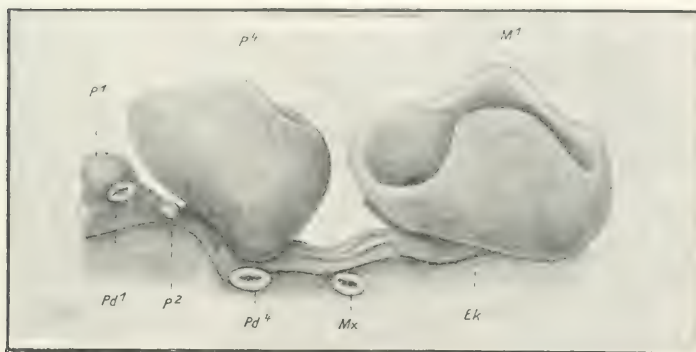






FIG. 1.

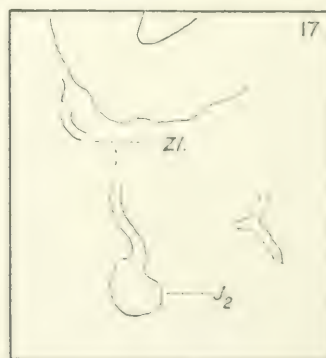
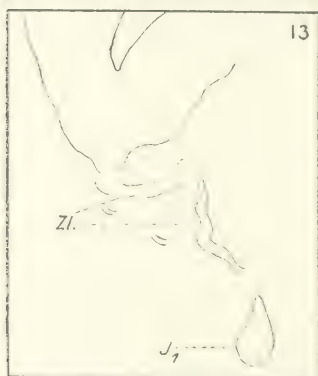
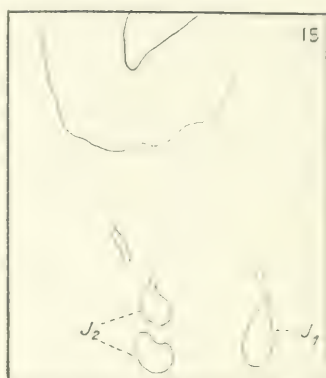
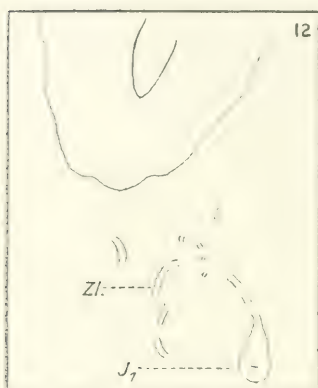
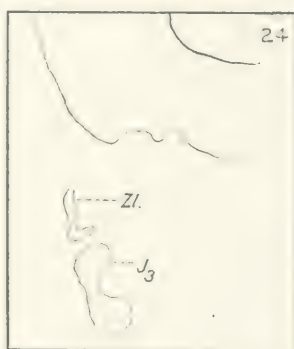
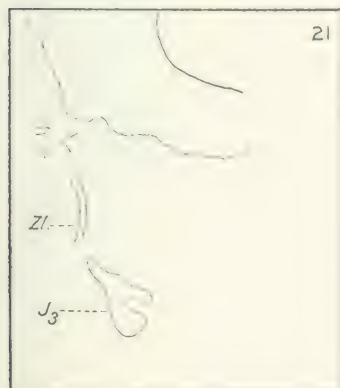
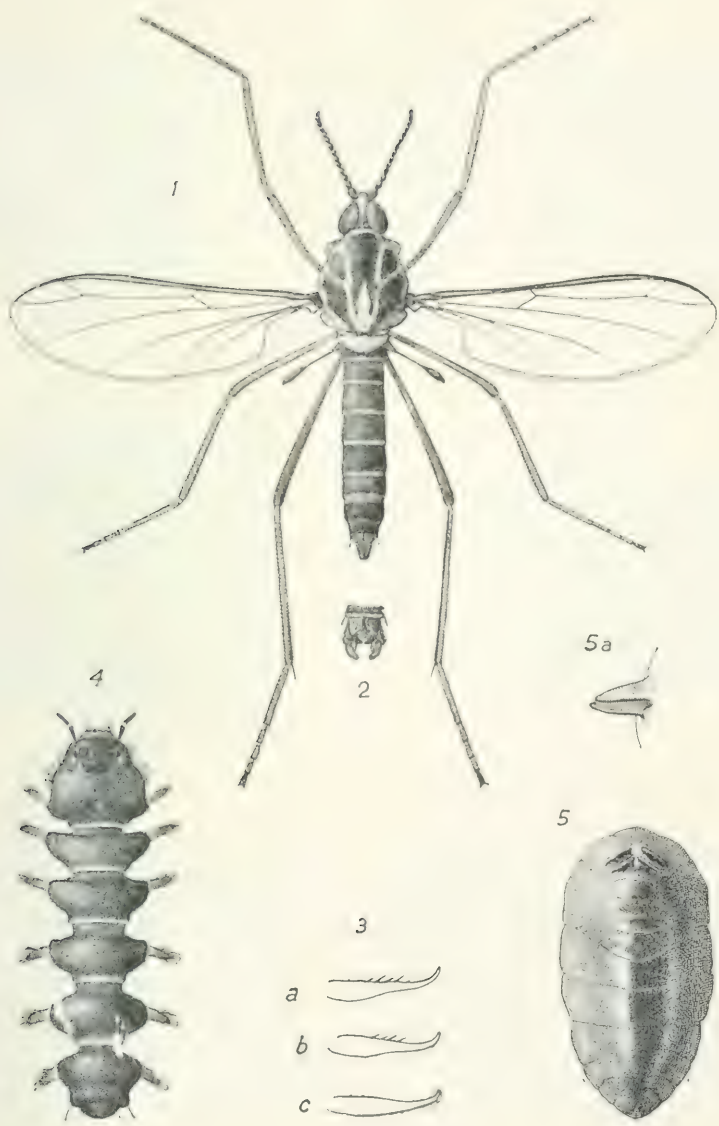




FIG. 2.







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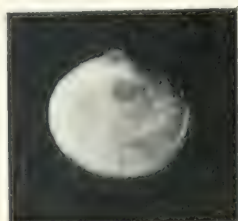




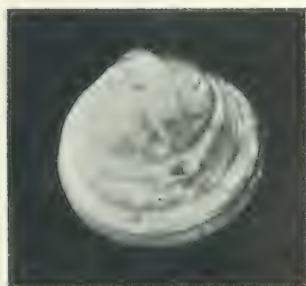
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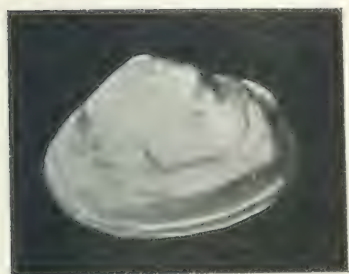
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